DOE/ORP-2000-10
Revision 1

River Protection Project Mission Analysis and Requirements Report

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

P.O. Box 450
Richland, Washington 99352

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Mission Analysis and Requirements Report

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RIVER PROTECTION PROJECT
MISSION ANALYSIS AND REQUIREMENTS REPORT

Approved by:

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Harry L. Boston, Manager
Office of River Protection

Date

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EXECUTIVE SUMMARY

This Mission Analysis and Requirements Report describes the River Protection Project (RPP) mission, the top-level functions that must be conducted to accomplish the mission, and the requirements that must be met to achieve these functions. The RPP participants will use this Report to develop the lower level functions and requirements necessary to conduct the work.

This Report describes the current situation (initial state), determines the desired outcome (end state), and establishes the top-level functions and requirements that will transform the initial state to the end state. The primary drivers for this mission and the boundary conditions and physical interfaces are defined. The physical architecture for the preferred alternative to accomplish the functions and requirements is described as well as the major RPP risks.

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LIST OF TERMS

AB	Authorization Basis
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
Ci	Curie
CFR	Code of Federal Regulations
D&D	deactivate and decommission
DOE	U.S. Department of Energy
DST	double-shell tank
Ecology	Washington State Department of Ecology
EM	Office of Environmental Management
ETF	Effluent Treatment Facility
EPA	U.S. Environmental Protection Agency
FR	Federal Register
FSAR	Final Safety Analysis Report
HLW	High-level Waste
IHLW	Immobilized High-level Waste
ILAW	Immobilized Low Activity Waste
LAW	Low Activity Waste
MCi	Megacurie (one million curies)
Mgal	Million gallons
MTG/d	Metric tons of glass per day
MUST	Miscellaneous Underground Storage Tank
NRC	U.S. Nuclear Regulatory Commission
NEPA	*National Environmental Policy Act of 1969*
NWPA	*Nuclear Waste Policy Act of 1982*
ORP	U.S. Department of Energy, Office of River Protection
OSHA	Occupational Safety and Health Administration
RCRA	*Resource Conservation and Recovery Act of 1976*
RL	U.S. Department of Energy, Richland Operations Office
ROD	Record of Decision
RPP	River Protection Project
RW	Office of Civilian Radioactive Waste Management
SST	single-shell tank
TEDF	Treated Effluent Disposal Facility
TPA	Tri-Party Agreement (*Hanford Federal Facility Agreement and Consent Order*)
TSCA	*Toxic Substances Control Act of 1976*
TWRS	Tank Waste Remediation System
WAC	Washington Administrative Code
WESF	Waste Encapsulation and Storage Facility
WTP	Waste Treatment and Immobilization Plant

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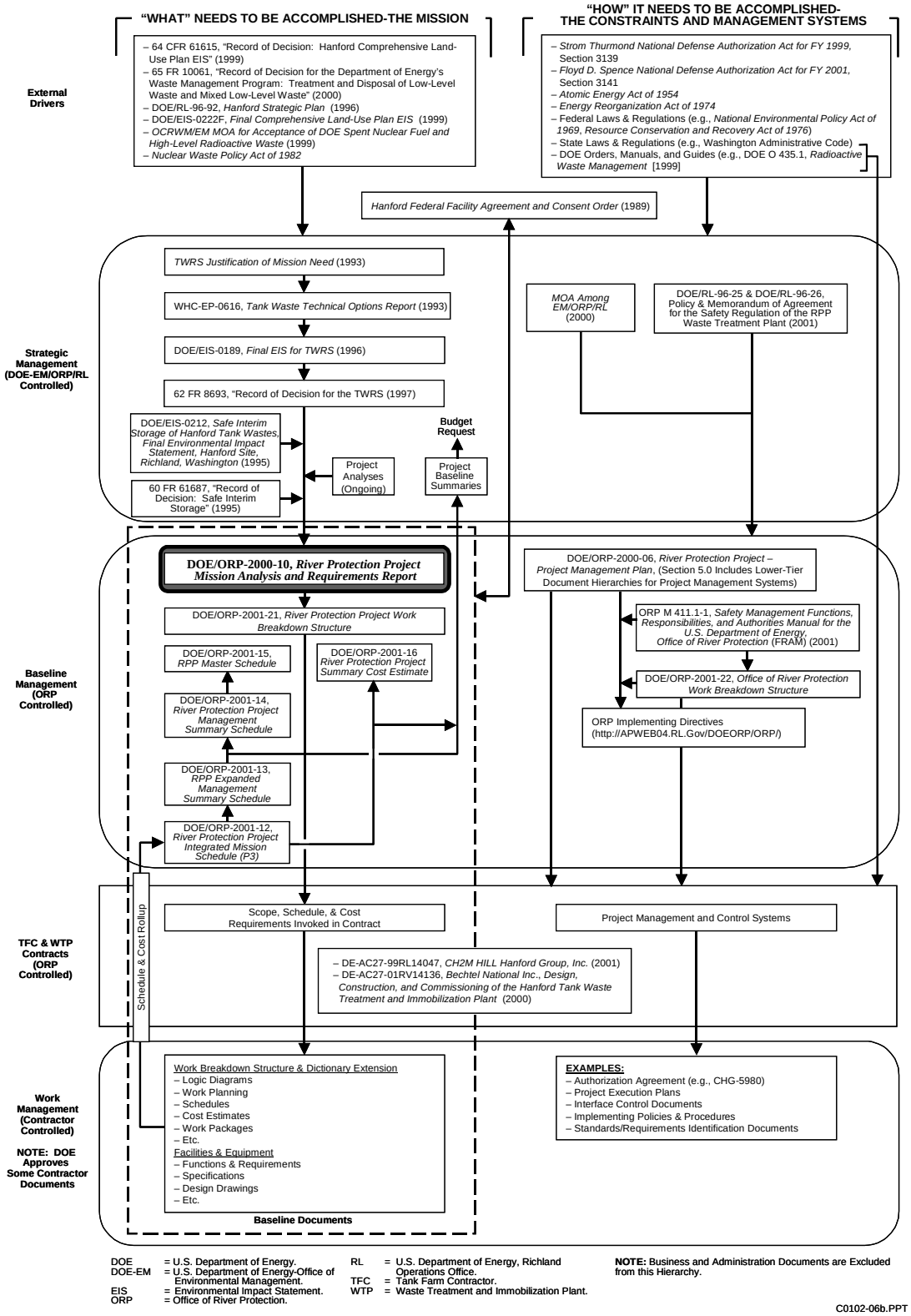
RIVER PROTECTION PROJECT
MISSION ANALYSIS AND REQUIREMENTS REPORT

1.0 INTRODUCTION

The purpose of the Mission Analysis and Requirements Report (MARR) is to describe the River Protection Project (RPP) mission and the upper-level functions that must be accomplished to meet the mission. The Report also identifies the upper-tier requirements that must be met to achieve these functions. The U.S. Department of Energy (DOE), Office of River Protection (ORP), will manage and control these functions and requirements as part of baseline management. The RPP participants will use these to develop the lower-level functions and requirements necessary to conduct the work.

This Report describes the current situation (initial state), describes the desired outcome (end state), and establishes the top-level functions and requirements that will transform the initial state to the end state. The report defines the primary drivers for this mission, the RPP site boundary conditions, and interfaces with other Hanford programs and activities. The Report also describes the physical architecture for the preferred alternative to accomplish the functions and the major RPP risks. This MARR is one of the RPP baseline management documents as shown on the Project Management Plan (PMP) Document Hierarchy (Figure 1-1). The RPP Work Breakdown Structure (WBS) and Dictionaries, which define the Project scope, refer to the MARR for system requirements.

Figure 1-1 River Protection Project Management Systems Document Hierarchy



2.0 MISSION

The mission of the RPP is to store, treat, immobilize, and dispose of the highly radioactive Hanford Site waste (current and future tank waste and cesium and strontium capsules) in a safe, environmentally sound, and cost-effective manner (DOE 1993). Simply stated, the mission is, "Build and operate the tank waste treatment complex to complete the cleanup of Hanford's highly radioactive tank waste." Completing this project will protect the Columbia River, the public, and the environment from these wastes. The RPP mission is consistent with the Department of Energy's Strategic Plan (DOE 2000a).

2.1 BACKGROUND

The federal government established the Hanford Site near Richland, Washington in 1943 to produce plutonium for the nation's nuclear defense program. Since then, highly radioactive waste from chemically processed irradiated reactor fuel has accumulated, with approximately 204,000 cubic meters (54 million gallons) of caustic liquid, salt cake, and sludge waste currently stored in 177 large, underground tanks.

In 1986, regulators from the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), and the DOE began to examine how best to bring the Hanford Site into compliance with the *Resource Conservation and Recovery Act of 1976* (RCRA), and the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). The regulators and the DOE agreed to develop one compliance agreement that established milestones for cleaning up hazardous substances. The three agencies signed the *Hanford Federal Facility Agreement and Consent Order* (known as the Tri-Party Agreement) on May 15, 1989. The agreement was revised in 1994 and 1996 to accommodate changes in the River Protection Project (then known as the Tank Waste Remediation System), and additional changes are negotiated as the project progresses.

In accordance with the *National Environmental Policy Act of 1969* (NEPA), the DOE prepared an Environmental Impact Statement in 1996 (DOE and Ecology 1996) and issued the, "Record of Decision for the Tank Waste Remediation System, Hanford Site, Richland, Washington," in 1997 (62 FR 8693). The DOE decided to proceed with tank waste retrieval, treatment, immobilization, and disposal in two phases. Phase I would be a demonstration phase in which a small portion of the waste would be processed, and Phase II would be a production phase to process the remaining waste. The DOE decided to defer action on the cesium and strontium capsules until the potential for future beneficial uses of capsules are determined, and the disposal alternatives are studied further to resolve uncertainties and better understand long-term impacts.

In 1998, Congress directed the DOE to establish the ORP to manage all aspects of the RPP.

2.2 STAKEHOLDER VALUES

Stakeholders are an important programmatic interface. They are interested or engaged in influencing the future of the Hanford Site as identified in the *Final Report: Hanford Tank Waste Task Force* (HTWTF 1993) and *Public Values Related to Decisions in the Tank Waste Remediation System Program* (Dirks and VonWinterfel 1994).

Stakeholder values of highest importance include the following.

1. Make progress with the cleanup activities.
2. Protect public and worker health and safety.
3. Protect the Columbia River.
4. Clean up to the level necessary to enable future land-use options to occur.
5. Capture economic development opportunities locally.
6. Protect the rights of the Native Americans.
7. Ensure compliance.
8. Reduce cost.

These values are considered in developing RPP plans.

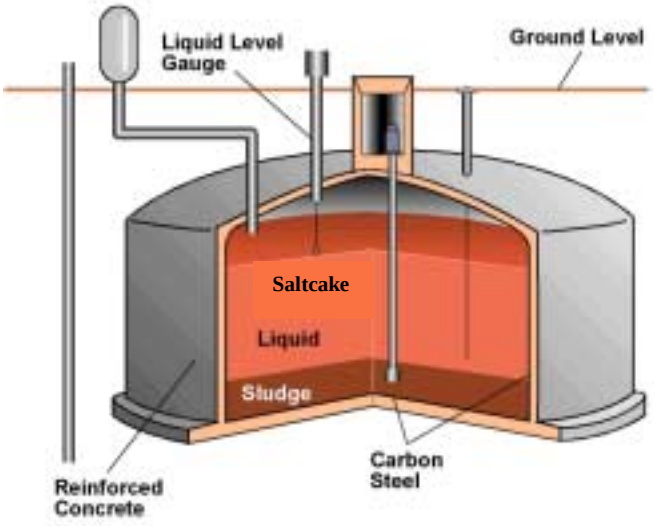
2.3 INITIAL STATE

The initial state (current situation) of the waste poses unacceptable long-term risk to the public and the environment. Waste treatment and tank farm cleanup actions are required to meet federal and state regulations. Waste is stored in some tanks that have far exceeded their design life, many have leaked waste to the surrounding soil, and some waste has reached the groundwater and threatens the Columbia River. The waste is inherently dangerous, and some tanks have specific safety concerns. There is an incomplete understanding of the waste that has leaked to the vadose zone and how fast it will migrate to the groundwater and Columbia River. The stored waste conditions are described below.

2.3.1 Single-Shell Tank Waste

Approximately 125,000 cubic meters (33 million gallons) of sludge, salt cake, and liquid waste is stored in 149 single-shell tanks (SST) in 12 tank farms. Sludge consists of hydrated metal oxides that resulted from the neutralization of nitric acid waste streams. Salt cake wastes consist of sodium nitrate/nitrite crystals that resulted from removal of water from neutralized waste supernatant liquid. The remaining supernatant liquid consists primarily of alkaline salt solutions. These tanks are constructed of reinforced concrete with a carbon steel liner covering the floor and wall. The tanks are buried in the ground, and 6 to 10 feet of soil cover their domes. Most are 23 m (75 feet) in diameter, and the largest have a capacity of 3,800 cubic meters (one million gallons) (Figure 2-1). No waste has been added to any of these tanks since 1980, and all have exceeded their design life by decades. Sixty-seven of these tanks have, or are assumed to have, leaked an estimated 3,800 cubic meters (1 million gallons) of waste to the surrounding soil.

Figure 2-1. Single-Shell Tank General Arrangement

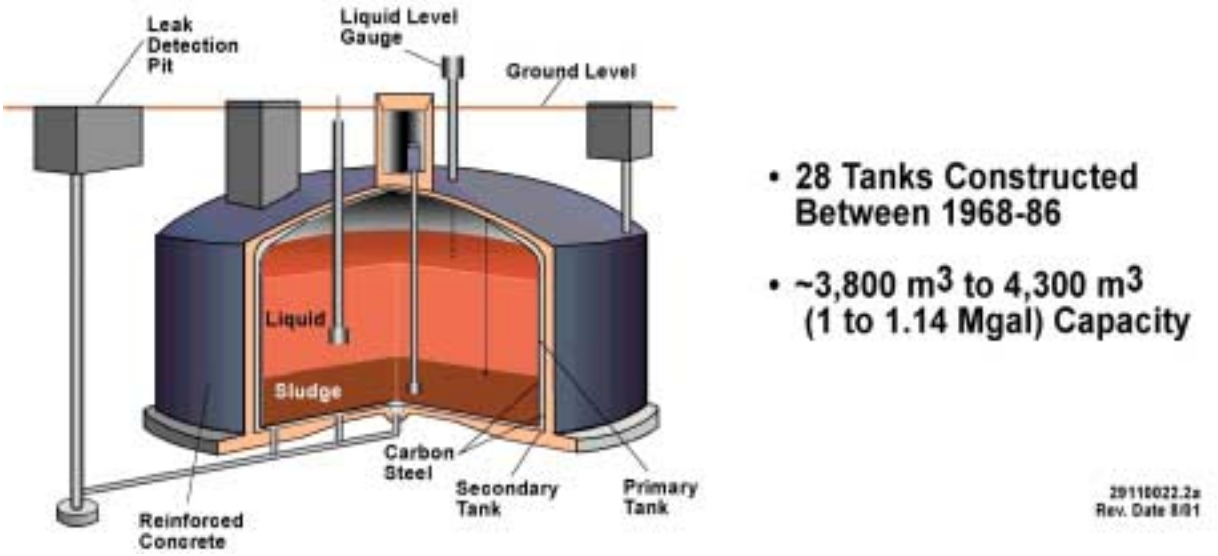


- **149 tanks constructed 1943-1964**
- **Bottom of tanks at least 50 m (150 feet) above groundwater**

2.3.2 Double-Shell Tank Waste

Approximately 80,000 cubic meters (21 million gallons) of waste, mostly liquids but also some sludge and salt cake is stored in 28 newer double-shell tanks (DST) in six tank farms. These tanks are an improved design with an additional tank inside the lined concrete tank structure (Figure 2-2). The waste is stored in the inner primary tank, and should it leak, the leaked waste would be contained inside the secondary tank until the tank contents could be pumped to another tank. None of these tanks are known to have leaked to date. These tanks are in active operations and continue to receive new waste from other Hanford facilities and the tank farms.

Figure 2-2. Double-Shell Tank General Arrangement



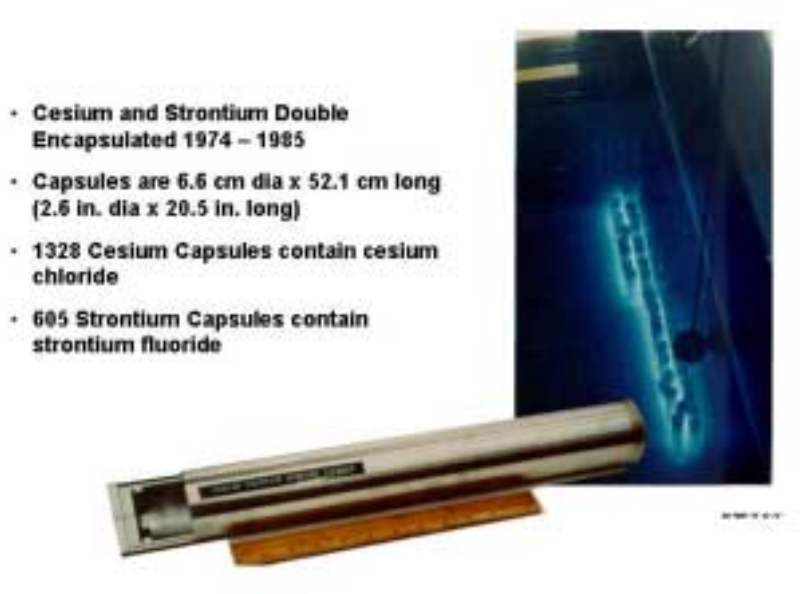
2.3.3 Miscellaneous Underground Storage Tank Waste

Approximately 760 cubic meters (200,000 gallons) of waste is stored in more than 60 smaller miscellaneous underground storage tanks (MUST) used for purposes such as catch tanks and settling tanks. These tanks have a variety of configurations and up to 190 cubic meters (50,000 gallons) in capacity. Most are not in active service.

2.3.4 Cesium and Strontium Capsules

The RPP will treat and dispose of 1,933 cesium and strontium capsules (see Figure 2-3) containing radioactive cesium chloride salt and radioactive strontium fluoride salt (currently stored by another program in the Waste Encapsulation and Storage Facility). The cesium and strontium were extracted from the tank waste in the 1960s and 1970s and were placed in welded, double-walled metal capsules.

Figure 2-3. Cesium-Strontium Capsules



2.3.5 Waste Inventory

The SST, DST, and capsule contents are described in the *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Wastes* (Kupfer et al. 1999). The tank waste inventory of radionuclides and chemicals is the "Best Basis Inventory" electronic database found at http://twins.pnl.gov. The waste has not yet been characterized sufficiently to provide the information needed to support all aspects of the RPP mission. The SSTs also contain materials and equipment used in experiments or storage and transfer operations. The MUSTs are estimated to contain less than 1 MCi of radioactive material. The RPP is also responsible for the contaminated soil in the tank farms from the ground surface down to the water table.

2.3.6 Facilities and Infrastructure

The facilities and infrastructure consist of numerous operations, maintenance, and office buildings; hundreds of miles of single- and double-wall pipelines (the pipelines are mostly below ground, are used to transfer radioactive wastes, and are contaminated); diversion boxes, clean-out boxes, catch tanks, and waste cribs; thousands of instruments; electrical power supply systems; ventilation systems; air compressors; pumps; and other appurtenances. The facilities and infrastructure construction started in 1943 and continues today.

2.4 DESIRED END STATE

The RPP end state is driven by the need to protect the public and the environment. To provide this protection, DOE's policy is to dispose of defense high-level waste in a federal geologic repository as directed by Congress in the *Nuclear Waste Policy Act of 1982*, as amended. The DOE is currently investigating a site in Nevada for this repository. The DOE has decided that Hanford is an acceptable low-level waste and low-level mixed waste disposal site (65 FR 10061) and that the central plateau (which includes the 200 Areas) will continue to be used for managing and disposing radioactive and hazardous waste (64 FR 61615). The RPP wastes are classified as RCRA waste and regulated by Ecology under Chapter 173-303 of the Washington Administrative Code. These regulations also apply to closure of the facilities and waste disposal sites. Therefore, the desired RPP end state is as follows:

- All waste has been retrieved from all the tanks to the extent necessary for closure, and the tanks and tank farms have been closed. ("The extent necessary for closure" has not yet been defined.)

- The retrieved waste has been immobilized, the immobilized low-activity waste (ILAW) has been disposed onsite and the disposal site closed; and, the immobilized high-level waste (IHLW) has been shipped to the offsite federal geologic repository for disposal (or turned over to the Hanford program responsible for long-term stewardship).

- The encapsulated cesium and strontium have been treated and shipped to the offsite federal geologic repository for disposal.

- All secondary wastes and effluents have been disposed either by the RPP or other Hanford Site programs.

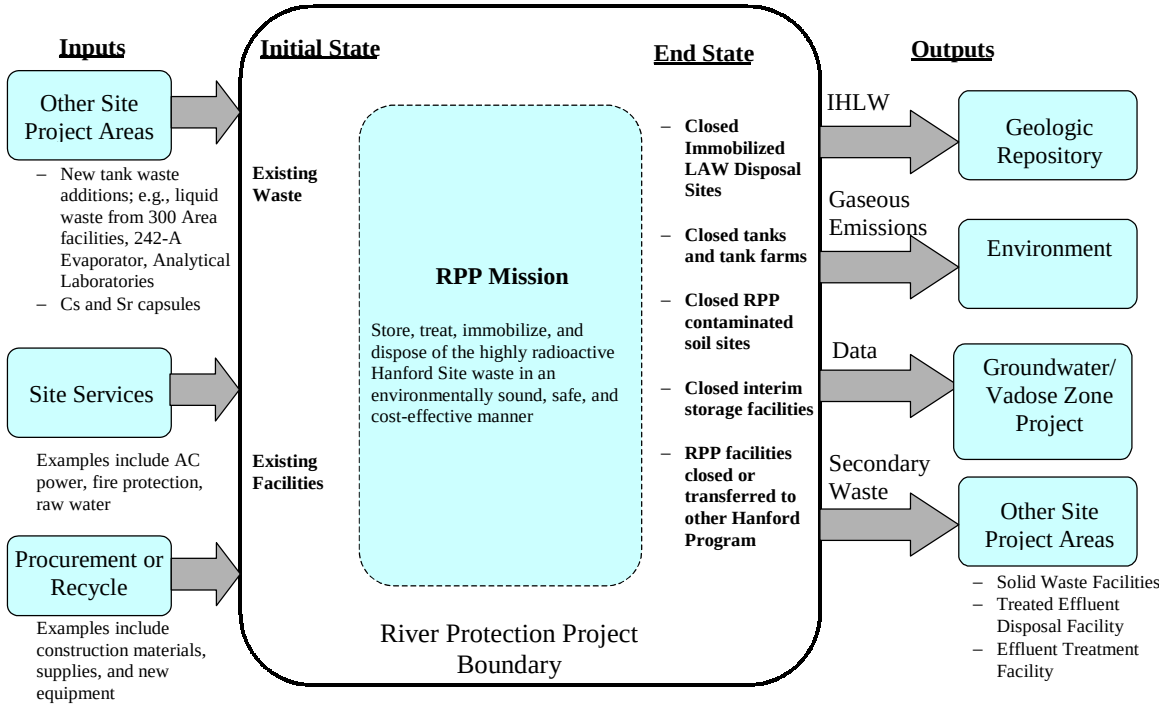
- All RPP facilities have been closed (disposed) or deactivated and turned over to the Environmental Restoration Program for disposition.

- Long-term monitoring systems are in place for the closed facilities and disposal sites and the responsibility for monitoring transferred to the Hanford Site program responsible for long-term stewardship.

3.0 RIVER PROTECTION PROJECT BOUNDARY AND INTERFACES

Because the RPP is located in the central portion of the Hanford Site, it is an integral part of the Site and interfaces with many other Hanford projects and activities. The RPP boundary and external physical interfaces are shown in Figure 3-1 and are described below.

Figure 3-1. River Protection Project Boundary and Interfaces Diagram



3.1 INPUTS

Some liquid waste continues to be generated by other Site cleanup projects and sent to the RPP DSTs. These include wastes from the 222-S Analytical Laboratory, 242-A Evaporator, T-Plant, 300-Area laboratories, and clean out of shutdown facilities.

Cesium-137 and strontium-90, separated from tank waste in the 1960s-1970s, are encapsulated and stored in the Waste Storage and Encapsulation Facility managed by another Site project. The RPP will prepare these high-level waste capsules for disposal. While no decision has yet been made, it is assumed that the capsule material will be incorporated into the HLW glass.

The RPP is relying on other site projects to provide several site services, such as electric power, raw water, fire protection, etc. These services are needed in order to construct, manage and operate the tank farms as well as new facilities including the Waste Treatment and Immobilization Plant (WTP), ILAW disposal facility, and IHLW storage facilities.

The RPP receives supplies and materials from a large number of suppliers. Examples are construction materials, chemicals, raw materials, tools, equipment, protective clothing, computers, office supplies, and vehicles.

New processing facilities, pipelines, and appurtenances are required to carry out the mission. These include large waste treatment and immobilization facilities, waste retrieval systems, and interconnecting pipelines.

3.2 OUTPUTS

The outputs of the RPP mission include IHLW, gaseous effluents, and solid and liquid secondary wastes. The principal output is IHLW canisters that will be shipped to a federal geologic repository.

RPP facilities will generate secondary solid and liquid wastes that will be disposed onsite. Solid wastes will be packaged and transported to Hanford's solid waste management facilities. Slightly radioactive liquid wastes will be sent to the Effluent Treatment Facility. This includes the water removed from the tank waste when it is processed through the 242-A Evaporator that is operated by another Hanford Program. However, the concentrated waste is returned to the tanks.

Some RPP facilities will emit gaseous effluents to the environment. The gaseous emissions will be permitted in accordance with Clean Air Act requirements.

The RPP is also responsible for collecting information related to contaminants that have leaked into the tank farm subsurface and providing the information to the DOE – Richland Operations Office (RL) managed Groundwater/Vadose Zone Integration Project. The data will be used to develop an understanding of site-wide contaminant migration risks to human health and the environment.

4.0 ARCHITECTURE

The architecture (or system) to conduct the RPP consists of both existing and new systems, structures, and components. A simplified flow diagram (Figure 4-1) provides the context for describing the system. Figure 4-2 identifies the location of the RPP facilities.

4.1 WASTE STORAGE

The waste must be safely stored until it is retrieved for treatment and disposal. This requires resolution of safety issues, interim stabilization of SSTs, waste characterization, reduction of waste volume by evaporation, and surveillance and maintenance of the waste and tank farms.

These activities will be conducted for the single- and double-shell tanks and the associated pipelines, tank farm facilities, and supporting laboratories. These facilities will be upgraded and modified as needed to complete their part of the project.

4.2 WASTE RETRIEVAL

Waste will be retrieved from all the tanks to the extent necessary for closure, staged in DSTs, and then fed to the waste treatment and immobilization facilities. After the waste has been removed from the tanks, the tank farms will be closed (disposed) in accordance with environmental regulatory provisions.

New waste retrieval facilities and pipelines will be required for SSTs and DSTs. Single-shell tank waste retrieval will use hydraulic sluicing systems, and DST retrieval will use mixer pumps to remove and deliver waste to the WTP. New SST waste retrieval systems likely will be required to remove waste heels, which are difficult to remove, and to retrieve waste from tanks that have leaked or may leak.

4.3 WASTE TREATMENT

The waste feed from the tanks will be separated into solid and liquid fractions. Key radionuclides will be removed from the liquid fraction so it can be classified as low-activity waste, and then it will be immobilized for onsite, near-surface disposal. The solid fraction will receive additional washing to dissolve more chemicals that become liquid waste. The radionuclides separated from the liquid fraction will be added to the solid fraction, which is classified as HLW, and immobilized for disposal in an offsite federal geologic repository.

These activities will be conducted in new facilities in two phases. In the first phase an Initial Quantity of waste (approximately 10 percent of waste by mass and 25 percent by radioactivity) will be treated, and the remaining waste will be treated in the second phase (called the Balance of Mission). Expanding the initial facilities will provide the additional capacity needed for the Balance of Mission. The treatment process will include solids/liquids separation, caustic sludge washing, ion exchange and precipitation for radionuclide removal, and vitrification. The molten HLW and LAW glass will be poured into stainless steel canisters where it will cool and solidify. The canisters will then be sealed and decontaminated.

Figure 4-1. RPP Simplified Flow Diagram

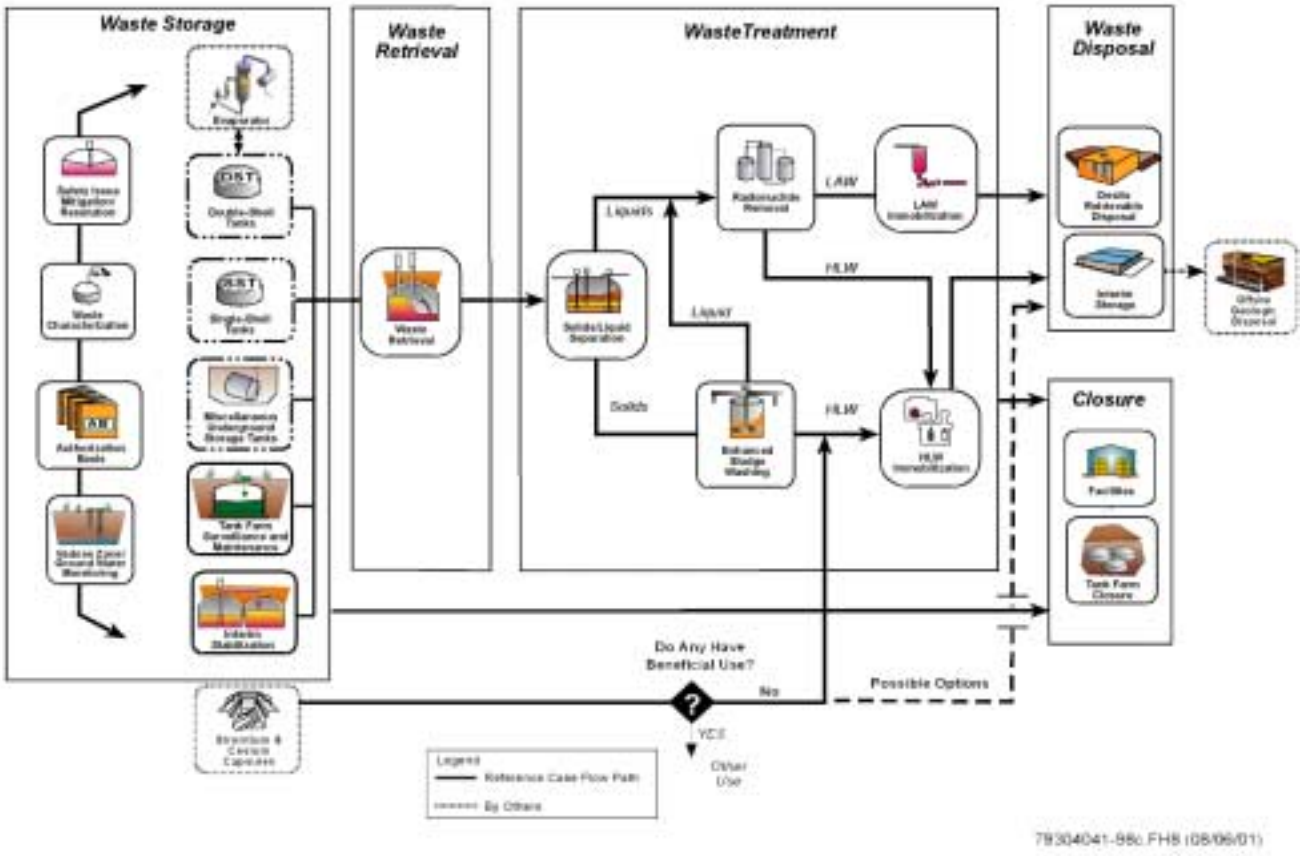


Figure 4-2. Locations of Major RPP Facilities

New facilities will be needed to prepare the cesium and strontium capsules to meet geologic repository acceptance criteria. It is currently envisioned that the capsules' contents will be vitrified along with the other HLW during the Balance of Mission.

4.4 WASTE DISPOSAL

The ILAW will be disposed onsite in near-surface facilities, and the IHLW will be stored onsite until it can be shipped to a federal geologic repository for disposal.

The ILAW will be disposed in new below-grade facilities in the 200 East Area. The facilities are envisioned to resemble Hanford mixed low-level waste burial trenches with intrusion-prevention barriers placed on top of the filled trenches. These facilities will be modular and constructed as needed.

A portion of the Canister Storage Building will be outfitted to store the IHLW canisters produced while processing the initial quantity of waste. Additional modular storage facilities will be constructed for the Balance of Mission. When the geologic repository is ready to start accepting Hanford's IHLW, a shipping facility will be needed to prepare the canisters and load them in the repository's shipping casks for transport to the repository.

4.5 CLOSURE

The approach for closing the tank farms after waste retrieval is completed has not been defined. Tank closure is envisioned to include back-filling the tanks with grout and/or gravel, constructing an intrusion-prevention barrier over the top of the tank farms, and installing long-term environmental monitoring (waste migration) instrumentation. Tank farm piping, pits, and structures will be removed or closed in place as part of tank farm closure. Other facilities, such as the new waste treatment and immobilization facilities, will be clean-closed or deactivated and transferred to another Hanford program for disposition.

4.6 ANALYSIS OF ARCHITECTURE TO MEET THE MISSION

Several scenarios for achieving the RPP mission using the planned architecture have been, and continue to be, analyzed (Kirkbride et al. 2000, Strode and Boyles 2000 or latest editions). These analyses indicate that the proposed architecture can achieve the mission, although it may not meet some of the current milestones. In addition, the processes and material flows have not yet been optimized and many assumptions remain to be validated. Consequently, changes to the architecture to improve efficiency and productivity are anticipated. A simplified process flow diagram and estimated material quantities depicting current process maturity is shown in Appendix A.

5.0 FUNCTIONS AND REQUIREMENTS

Completing the RPP mission requires transforming the current conditions (the initial state) to the desired end state. This transformation occurs by completing tasks, activities, and actions; referred to as *functions.* The upper-level functions are described in Section 5.1.

Once the functions have been established, requirements must be defined to provide assurance the end product will meet the mission need. Requirements come from external sources such as laws and regulations; interfaces between functions or to external systems, and internal derivations to quantify how the functions must perform. Section 5.2 provides a brief discussion on the upper-level RPP requirements and where they are described.

5.1 FUNCTIONS DESCRIPTION

The functional logic diagram (Figure 5-1) depicts the functions for the entire RPP life cycle. Some near-term functions are more fully developed than those that will not be needed until ten years or more from now, and some functions have already been completed, as noted on the diagram. The top hierarchy of the functional logic consists of six functions:

- Store
- Retrieve
- Treat
- Dispose
- Close
- Manage Project

All sub-functions are grouped within one of these six functions as shown on the functional logic diagram. The following sections list each RPP function by its functional logic diagram title and number, and describe the function. The RPP upper-level Work Breakdown Structure (WBS) matches the functional logic diagram and a common numbering system is used. The WBS and a diagram mapping the RPP functional logic diagram to the WBS are provided in Appendix B.

5.1.1 Store [5.01]

Store Hanford high-level radioactive tank waste safely until it can be retrieved for treatment and disposal.

Conduct Central Operations [5.01.01]

Conduct tank surveillance and data analysis, verify adherence to authorization basis, conduct emergency planning drills, and report unusual events for all tank farm activities.

Conduct Tank Farm Safe Operations [5.01.02.01 & 5.01.03.01]

Safely receive and store high-level radioactive tank waste in compliance with the Authorization Agreement (CHG) and DOE O 435.1 (DOE 1999a) until it can be retrieved for processing and disposal.

Maintain Tank Farms [5.01.02.02 & 5.01.03.02]

Maintain tank farm facilities, equipment and controls so that the tank farms can be operated within the Authorization Agreement (CHG) and DOE O 435.1 (DOE 1999a).

Close Safety Issues [5.01.02.03 & 5.01.03.03]

Resolve any tank waste safety issues.

Upgrade Tank Farms [5.01.02.04 & 5.01.03.04]

Upgrade tank farms to comply with federal and state regulations and permits, and to function safely until closed.

Assess DST Integrity [5.01.03.05]

Inspect and analyze the DSTs to determine if they still meet their design requirements and to forecast their remaining service life in accordance with the *Tank Integrity Administrative Order* (Administrative Orders No. 00NWPKW-1250 and 00NWPKW-1251).

Manage Capacity and Inventory [5.01.03.06]

Maximize double-shell tank space available for receipt of other wastes by consolidating compatible waste types, concentrating dilute wastes, and managing tank farms to achieve optimal space usage within the DST system. Conduct waste receipt and waste transfers as forecast in the *Operational Waste Volume Projection* (Strode and Boyles 2000 or latest edition). Develop and maintain tank waste inventory data.

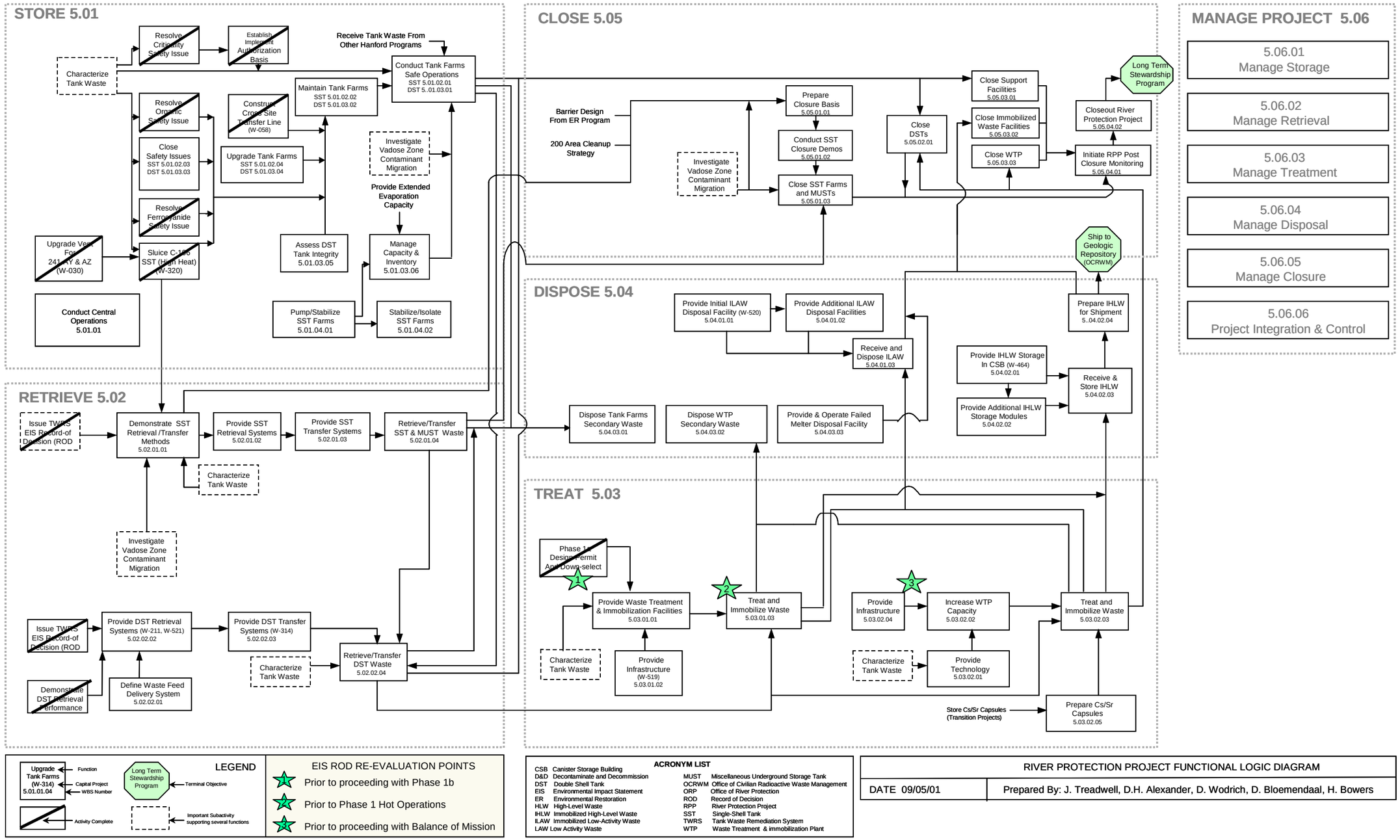
Pump/Stabilize SST Farms [5.01.04.01]

Remove pumpable liquid from SSTs as specified in the *Interim Stabilization Consent* Decree (Ecology 1999). Prevent the intrusion of liquids into SSTs that have had liquids removed.

Stabilize/Isolate SST Farms [5.01.04.02]

Stabilize/isolate the SST farms to minimize migration of waste from tanks and in surrounding soil until the waste can be retrieved and the tank farms closed.

Figure 5-1. RPP Functional Logic Diagram



5.1.2 Retrieve [5.02]

Retrieve waste from all tanks to the extent needed for tank closure and transfer it to the WTP.

Demonstrate SST Retrieval/Transfer Methods [5.02.01.01]

Develop improved methods and establish requirements for retrieving and transferring waste from the SSTs and design, procure, and construct SST retrieval demonstration systems. Demonstrate that SST waste can be removed to the extent needed for closure and will meet the WTP feed requirements.

Provide SST Retrieval Systems [5.02.01.02]

Design, procure, and construct SST retrieval systems to retrieve wastes from SSTs in accordance with the methods and requirements developed under the function, Demonstrate SST Retrieval/Transfer Methods [5.02.01.01].

Provide SST Transfer Systems [5.02.01.03]

Design, procure, and construct tanks, pumps, pipelines, and controls to deliver waste sluicing liquids and transfer retrieved waste from SSTs to DSTs that meet the WTP feed delivery requirements.

Retrieve/Transfer SST and MUST Waste [5.02.01.04]

Retrieve wastes from SSTs and MUSTs to the extent needed for closure and transfer it to DSTs as quickly as uncommitted DST space becomes available. The retrieved waste shall meet WTP feed delivery requirements.

Define Waste Feed Delivery Systems [5.02.02.01]

Define waste feed delivery technical bases, tank retrieval sequence, and facility and equipment needs.

Provide DST Retrieval Systems [5.02.02.02]

Design, procure, construct, and install systems to retrieve DST wastes that will meet the WTP waste feed requirements.

Provide DST Transfer Systems [5.02.02.03]

Design, procure, and construct systems for transferring waste between DSTs and to and from the WTP.

Retrieve/Transfer DST Waste [5.02.02.04]

Retrieve, stage and transfer DST waste that meets feed requirements to the WTP. Receive and transfer waste that meets waste return requirements from the WTP to the DSTs.

5.1.3 Treat [5.03]

Separate waste into two fractions, remove key radionuclides from the low-activity waste streams to be disposed on the Hanford Site and incorporate them into the high-level waste stream, immobilize both waste streams, and package waste in containers ready for storage or disposal.

Provide the WTP [5.03.01.01]

Design, construct, and commission the WTP so that it:

1. Separates the waste into two fractions such that when processed and immobilized, the bulk of the chemicals can be disposed in lower cost, onsite, near surface facilities and the bulk of the radionuclides can be disposed in an offsite geologic repository.

2. Immobilizes the low-activity waste fraction and packages it for disposal as LLW.

3. Vitrifies and packages the HLW fraction in compliance with the geologic repository waste acceptance criteria.

4. Demonstrates it can meet product quality and production rate requirements.

Provide Infrastructure [5.03.01.02]

Provide infrastructure to support construction and operation of the WTP.

Treat and Immobilize Waste [5.03.01.03]

Receive waste feed at the WTP, separate the tank waste into LAW and HLW fractions, immobilize the LAW and place in packages ready for disposal on the Hanford Site, and immobilize the HLW and place in canisters that comply with the geologic repository waste acceptance criteria.

Provide Technology [5.03.02.01]

Develop technology to improve the efficiency, safety, and capacity of the WTP so that the waste can be treated and immobilized on a schedule and at a cost that are acceptable.

Increase WTP Capacity [5.03.02.02]

Increase WTP capacity to complete treatment and immobilization of the tank waste on a schedule and at a cost that are acceptable.

Treat and Immobilize Waste [5.03.02.03]

Receive waste feed at the WTP, separate the tank waste into LAW and HLW fractions to minimize the HLW fraction. Immobilize the LAW and place in packages ready for disposal on the Hanford Site; and. immobilize the HLW and place in canisters meeting geologic repository waste acceptance criteria and ready for storage on the Hanford Site.

Provide Infrastructure [5.03.02.04]

Provide the infrastructure necessary to support the increased operational capacities of the WTP during the Balance of Mission.

Prepare Cs/Sr Capsules [5.03.02.05]

Prepare cesium and strontium capsules for disposal in accordance with the supplemental Record of Decision (ROD) to be developed in the function, Manage Treatment (5.06.03).

5.1.4 Dispose [5.04]

Dispose immobilized low-activity waste (ILAW) and other low-level secondary wastes onsite in near surface disposal facilities, and store immobilized high-level waste (IHLW) onsite until it can be shipped to an offsite geologic repository or turned over to the Hanford Program responsible for Long-term stewardship.

Provide Initial ILAW Disposal Facilities [5.04.01.01]

Provide facilities for disposing of the initial quantity of ILAW packages in the Hanford Site's 200-E Area, and procure the equipment to transport the ILAW packages from the WTP to the initial ILAW disposal facilities.

Provide Additional ILAW Disposal Facilities [5.04.01.02]

Provide additional facilities for disposing ILAW packages in the Hanford Site's 200-E Area, and procure any additional equipment necessary to transport the ILAW packages from the WTP to the additional ILAW disposal facilities.

Receive and Dispose ILAW [5.04.01.03]

Receive ILAW packages from the WTP at the rate they are produced, and transport and dispose of ILAW in the Hanford Site's 200-E Area ILAW disposal facilities.

Provide IHLW Storage in CSB [5.04.02.01]

Provide capability for storing IHLW canisters in the Canister Storage Building (CSB) and procure the equipment to transport the IHLW canisters from the WTP to the CSB.

Provide Additional IHLW Storage Modules [5.04.02.02]

Provide additional IHLW canister storage modules for use after storage space in the CSB is filled. Procure any additional equipment needed to transport the IHLW canisters from the WTP to the additional IHLW storage modules.

Receive and Store IHLW [5.04.02.03]

Receive IHLW canisters from the WTP at the rate they are produced, and transport and store IHLW in the IHLW storage facilities.

Prepare IHLW for Shipment [5.04.02.04]

Provide a shipping facility, transport IHLW canisters from interim storage, and prepare and load IHLW canisters into repository owned casks for shipment to the offsite geologic repository at the rate the repository will accept them.

Dispose Tank Farm Secondary Waste [5.04.03.01]

Dispose tank farm liquid and solid secondary waste by transferring it to the Hanford Waste Management Program for treatment and/or disposal.

Dispose WTP Secondary Waste [5.04.03.02]

Dispose of the WTP secondary liquid and solid radioactive waste by transferring it to the Hanford Waste Management Program for treatment and/or disposal.

Provide and Operate Melter Disposal Facility [5.04.03.03]

Design, construct, and operate a low-level waste disposal facility for disposing of spent and failed melters from the WTP.

5.1.5 Close [5.5]

Close (or deactivate and transfer) all RPP facilities and waste sites, including tank farms, pipelines, treatment facilities, support facilities, and appurtenances; and establish long term monitoring capability for sites and facilities that cannot be clean closed.

Prepare Closure Basis [5.05.01.01]

Develop information and documentation that provides the basis for closing the SST farms and MUSTs in conformance with DOE O 435.1 (DOE 1999b) and Milestone Number M-45-00 of the *Hanford Federal Facility Agreement and Consent Order* (Ecology, EPA, and DOE 1989).

Conduct SST Closure Demos [5.05.01.02]

Conduct SST Closure Demos to test and confirm methods on a demonstration tank farm in accordance with TPA Milestone 045-06-T03 & T04.

Close SST Farms and MUSTs [5.05.01.03]

Close SST farms and MUSTs in conformance with closure plans approved by Ecology, the NEPA documentation developed under the function, Manage Closure [5.06.05], and DOE Order 435.1.

Close DSTs [5.05.02.01]

Close double-shell tanks when they are no longer required to conduct the RPP mission in conformance with closure plans approved by Ecology, the NEPA documentation developed under the function, Manage Closure [5.06.05] and DOE O 435.1.

Close Support Facilities [5.05.03.01]

Deactivate inactive tank farm facilities no longer required to conduct the mission and transfer to other Hanford programs (i.e. The Environmental Restoration Decontamination and Decommissioning Program), or close in accordance with closure plans approved by Ecology.

Close Immobilized Waste Facilities [5.05.03.02]

Deactivate the IHLW storage and shipment facilities, transfer to other Hanford programs for use or D&D, or close. Close the RPP immobilized low-level waste disposal facilities in accordance with DOE O 435.1.

Close WTP [5.05.03.03]

Deactivate the WTP and transfer to another Hanford program for use or D&D, or close.

Initiate RPP Post-Closure Monitoring [5.05.04.01]

Initiate and perform monitoring of closed RPP facilities to: 1) determine if wastes or waste constituents are migrating from closed RPP facilities, 2) ensure that closed RPP facilities are not posing unanticipated risks to human health or the environment, and 3) identify unexpected failures or deficiencies of the closed RPP facilities.

Closeout the RPP [5.05.04.02]

Closeout the RPP by transferring the post-closure monitoring responsibility to the Hanford Site program responsible for long-term stewardship, and completing and archiving all records.

5.1.6 Manage Project [5.06]

Plan, organize, direct, budget, and measure and control performance to ensure the project accomplishes the mission on schedule in a safe, environmentally sound, and cost effective manner.

Manage Storage [5.06.01]

Provide ORP direction and oversight to the Storage function [5.01] to ensure the work is conducted safely, complies with requirements and regulations, and performance is measured and controlled.

Manage Retrieval [5.06.02]

Provide ORP direction and oversight to the Retrieval function [5.02] to ensure the work is conducted safely, complies with requirements and regulations, and performance is measured and controlled.

Manage Treatment [5.06.03]

Provide ORP direction and oversight to the Treatment function [5.03] to ensure the work is conducted safely, complies with requirements and regulations, and performance is measured and controlled. Prepare supplemental Record of Decision (ROD) for disposition of cesium and strontium capsules.

Manage Disposal [5.06.04]

Provide ORP direction and oversight to the Disposal function [5.04] to ensure the work is conducted safely, complies with requirements and regulations, and performance is measured and controlled.

Manage Closure [5.06.05]

Provide ORP direction and oversight to the Closure function [5.05] to ensure the work is conducted safely, complies with requirements and regulations, and performance is measured and controlled. Prepare NEPA documentation for RPP facility closures.

Project Integration & Control [5.06.06]

Plan, integrate, measure and control the RPP; provide supporting services (i.e. financial, procurement, legal, public affairs, administrative, and site); and manage activities that span the project.

5.2 REQUIREMENTS

The requirements that must be met for the each of the functions described in Section 5.1 define either the technical condition that must be satisfied, or conditions on how work is to be performed. The former is referred to as *system requirements*, and is the focus of the requirements presented in this report. The later is referred to as *management requirements.*

System requirements apply primarily to the Store, Retrieve, Treat, Dispose, and Close functions of the RPP, while management requirements apply primarily to the Manage Project function. The purpose of the system requirements is to define *what* needs to be accomplished (i.e. what condition must be achieved) and *how well* it needs to be done (i.e. what are the conditions of successful completion). The purpose of management requirements is to define *how* work is to be done and the *constraints* or *rules* that must be followed while doing work.

The RPP baseline system requirements are described in Appendix C. Additional project requirements are defined in lower-level contractor prepared documents, some requiring ORP approval or concurrence. The management requirements can be found in a number of documents identified as follows:

- For the ORP:
  - DOE directives as listed in www.Directives.DOE.Gov/: DOE O 435.1 *Radioactive Waste Management,* and the accompanying DOE M 435.1 are the primary directives that apply to the RPP. The manual also identifies additional DOE directives (Orders) that must be followed for 21 of the topical requirements.
  - *Functions, Responsibilities, and Authorities Manual* (FRAM) for Environmental, Safety, Health and Quality.
  - *River Protection Project – Project Management Plan* identifies many management system documents that include management requirements.
  - *Hanford Federal Facility Agreement and Consent Order*

- For the contractors conducting the RPP work:
  - *Waste Treatment and Immobilization Plant* contract Section C, Section I, Contract Clauses, and Section J, Attachment E, List of Applicable Directives (List B-DEAR 970.5204.78)
  - *Tank Farm* contract Section C, and Section J, Appendix C– DOE DIRECTIVES

6.0 RISKS

The multi-decade RPP project involves many uncertainties, which may be stated as risks to successful completion of the project as planned. Understanding project risks will help ensure that resources are applied to appropriate activities and will guide development of back-up plans and contingency actions.

The top-level requirements for risk management within ORP are established in the *River Protection Project - Project Management Plan* (ORP 2000). Individual contractors are responsible for their own risk management procedures, consistent with these requirements.

The major project risks are discussed below.

6.1 WASTE STORAGE

There is a risk that an unanticipated event or accident could occur that would slow or halt tank-farm operations and discredit the project. Examples of unanticipated events include failure of a double-shell tank sooner than forecast, a significant release of waste to the environment, and information that radioactive waste from past tank leaks migrated much faster than projected. Examples of significant accidents include an industrial accident in which workers are seriously injured or killed and a fire in a waste tank. While the probability of these events is considered very small, any such event would likely redirect resources to mitigating the cause and delay other project activities, including construction and operation of the WTP.

6.2 WASTE RETRIEVAL

Retrieving wastes from SSTs to the extent needed for closure, particularly those that have leaked, at an acceptable cost, is a significant risk. Single-shell tank waste has been retrieved at Hanford using hydraulic sluicing. Retrieval systems that utilize large amounts of liquid may not be acceptable for tanks that have leaked or could leak. The capability of retrieval systems to clean the tanks to the extent needed for closure is also unknown. This risk could result in much higher project costs and/or unacceptable leaks to the environment.

6.3 WASTE TREATMENT

There are risks associated with design, construction, and operation of the WTP. The capability of this large, complex facility to meet performance requirements will not be known until after it is constructed and in operation. The three most significant technical risks are related to plant capacity, performance of the IHLW and ILAW waste forms, and permitting.

The WTP is being designed to treat waste and produce immobilized waste packages that will meet acceptance criteria for disposal onsite (ILAW) and at a geologic repository (IHLW) offsite. However, the performance assessments and regulatory processes that will establish the required characteristics of the waste forms and waste containers have not been completed. Thus, there is a risk that the waste products will not be acceptable.

The capability of the LAW melter systems to make glass at the design capacity is uncertain. The melters will be significantly larger than any radioactive waste melter operating today.

Portions of Hanford tank wastes contain polychlorinated biphenyls (PCBs). PCBs are substances regulated under the *Toxic Substances Control Act of 1976* (TSCA). In addition, the presence of PCBs may also be regulated under other environmental regulations, such as RCRA, the *Clean Air Act*, and *Clean Water Act*. The presence of PCBs in tank waste and resulting regulatory uncertainty could impact the design of the vitrification plant, secondary waste treatment systems (e.g., offgas treatment systems) and WTP secondary waste disposal activities (e.g., waste water discharges to the Effluent Treatment Facility).

Processes and equipment are being tested and regulators and ORP are working together on the PCB issue to reduce these risks

6.4 WASTE DISPOSAL

The IHLW packages must be certified to be in compliance with waste acceptance requirements before they are accepted for disposal in the geologic repository. Current waste acceptance requirements for the repository exclude waste that is regulated as a hazardous waste under RCRA. Delisting will be pursued. However, there is a risk that Hanford IHLW cannot be delisted or the repository requirement cannot be changed.

There is a risk that a federal geologic repository will not be available or able to receive all of the Hanford IHLW. Repository siting and construction is controversial and opposed by Nevada, where the Yucca Mountain Project is located. The Nuclear Waste Policy Act also limits the amount of waste and spent fuel placed in the first repository to 70,000 MTU until a second repository is in operation. There is a risk that construction of the repository will be delayed or it will not be constructed, and if built, it will not be able to receive all of the Hanford IHLW (DOE 1999d). To mitigate this risk, the RPP will provide interim on-site storage for all of the Hanford IHLW if needed, and DOE is seeking legislative relief from the 70,000 MTU limit.

6.5 CLOSURE

The approach for closing the tank farms, following completion of the waste retrieval operations, has not been defined. Two important issues that must be resolved before a closure plan can be approved are:

- How much residual waste can remain in the tanks after retrieval, and what are acceptable health and safety risks?

- Is removal of tank structures, contaminated infrastructure, and contaminated soil required, and if so, what are the requirements?

Retrieval demonstrations, SST integrity determinations, waste characterization, vadose zone characterization, contaminant migration modeling, risk analysis, and understanding of the geology in which the tanks are located will all help determine the tank farm closure method. If it is determined closure requires much more than back-filling the tanks and adding an intrusion barrier over the top of the tank farms, additional technology may have to be developed, and the project cost could significantly increase.

6.6 REGULATORY, COST, AND SCHEDULE RISKS

National policy and DOE and Hazardous Waste regulations drive the RPP. There is a significant risk that changes will occur in these policies and regulations over the multi-decades it will take to complete this project. If future changes in regulations follow past trends, regulations will become more stringent, resulting in increased project costs and schedule slips. However, some regulatory relief may be possible, which could have the opposite effect.

A major RPP risk is acquiring funding to meet key commitments and carry out the project as planned. Current life cycle cost estimates indicate a sharp rise in funding levels will be needed to meet commitments and complete the project. Alternative strategies and cost reduction initiatives will be pursued to reduce this risk.

There are significant risks in meeting schedule commitments. Three important milestones that represent major risks include WTP start of hot commissioning in December 2007, complete SST waste retrieval in 2018, and complete waste immobilization in 2028. The risks result from contractor performance (e.g. the termination of the privatization waste treatment contract), technical issues (e.g., the logistics involved to retrieve wastes from multiple SSTs simultaneously), and funding ceilings.

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7.0 REFERENCES

Code of Federal Regulations

10 CFR 1021, "National Environmental Policy Act Implementing Procedures," *Code of Federal Regulations*.

40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*.

40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions," *Code of Federal Regulations*.

40 CFR 1500, "Purpose, Policy, and Mandate," 1501, "NEPA and Agency Planning," 1502, "Environmental Impact Statement," 1503, "Commenting," 1504, "Predecision Referrals to the Council of Proposed Federal Actions Determined to be Unsatisfactory," 1505, "NEPA and Agency Decisionmaking," 1506, "Other Requirements of NEPA," 1507, "Agency Compliance," and 1508, "Terminology and Index," *Code of Federal Regulations.*

Federal Register

62 FR 8693, 1997, "Record of Decision for the Tank Waste Remediation System, Hanford Site, Richland, WA" *Federal Register*, Vol. 62, pp. 8693-8704 (February 26).

64 FR 61615, 1999, "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)" *Federal Register*, Vol. 64, pp. 61615-61625 (November 12).

65 FR 10061, 2000, "Record of Decision for the Department of Energy's Waste Management Program: Treatment and Disposal of Low-level Waste and Mixed Low-level Waste; Amendment of the Record of Decision for the Nevada Test Site" *Federal Register*, Vol. 65, pp. 10061-10066 (February 25)

Acts

Clean Air Act of 1955, as amended, 42 USC 7401 et seq.

Clean Water Act of 1977, as amended, 33 USC 1251 et seq.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 USC 9601 et seq.

National Environmental Policy Act of 1969, as amended, 42 USC 4231 et seq.

Na*tional Defense Authorization Act for Fiscal Year 1991*, Public Law 101-510, "Safety Measures for Waste Tanks at Hanford Nuclear Reservation," Section 3137.

Nuclear Waste Policy Act of 1982, as amended, 42 USC 10101 et seq.

Resource Conservation and Recovery Act of 1976, as amended, 42 USC 6901 et seq.

Toxic Substances Control Act of 1976, as amended, 15 USC 2601 et seq.

Documents

CHG, *River Protection Project Authorization Agreement Between the U. S. Department of Energy Office of River Protection and CH2MHILL Hanford Group, INC.*, CHG-5980 Rev. 0, June 26, 2000 (or latest edition).

Dirks, L. L., and D. VonWinterfel, 1994, *Public Values Related to Decisions in the Tank Waste Remediation System Program*, PNL-10107, Pacific Northwest Laboratory, Richland, Washington.

DOE, 1993. *Justification of Mission Need, Hanford Site Tank Waste Remediation System to the Energy System Acquisition Advisory Board*, U.S. Department of Energy, Washington, D.C.

DOE, 1998. *Life Cycle Asset Management*, DOE Order 430.1A, U.S. Department of Energy, Washington, D.C.

DOE, 1999a, *Radioactive Waste Management*, DOE Order 435.1, U.S. Department of Energy, Washington, D.C.

DOE, 1999b, *Radioactive Waste Management Manual*, DOE Manual 435.1-1, U.S. Department of Energy, Washington, D.C.

DOE, 1999c, *Waste Acceptance System Requirements Document (WAS-RD)*, DOE/RW-0351, Rev. 3, U.S. Department of Energy, Office of Civilian Radioactive Waste Management, Washington, D.C.

DOE, 1999d. *Memorandum of Agreement for Acceptance of Department of Energy Spent Nuclear Fuel and High-Level Radioactive Waste Between the Assistant Secretary for Environmental Management (EM), U.S. Department of Energy (DOE), Washington, D.C., and the Director, Office of Civilian Radioactive Waste Management (RW)*, U.S. Department of Energy, Washington, D.C.

DOE, 2000a. *Department of Energy Strategic Plan*, September 2000.

DOE, 2000b. *Waste Treatment and Immobilization Plant Contract*, Contract No. DE-AC27-01RV14136, U.S. Department of Energy, Office of River Protection, Richland, Washington.

DOE and Ecology, 1996, *Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement*, DOE/EIS-0189, U.S. Department of Energy and Washington State Department of Ecology, Washington, D.C.

DOE, 2001. *CH2M HILL Hanford Group, Inc.*, Contract No. DE-AC27-99RL14047, U.S. Department of Energy, Office of River Protection, Richland, Washington.

Ecology, 1999, *Hanford High Level Radioactive Waste Interim Stabilization Program and Interim Consent Decree*, proposed Tri-Party Agreement Modification, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Ecology, 2000, "Dangerous Waste Regulations," *Washington Administrative Code*, WAC 173-303, as amended, Washington State Department of Ecology, Olympia, Washington.

Ecology and EPA, 1994, *Hanford Facility RCRA Permit*, WA7890008967, as modified, Washington State Department of Ecology and U.S. Environmental Protection Agency, Olympia, Washington.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

FDH, 1999a, *Tank Waste Remediation System Technical Safety Requirements*, HNF-SD-WM-TSR-006, Rev. 1, Fluor Daniel Hanford, Inc., Richland, Washington.

FDH, 1999b, *Tank Waste Remediation System Final Safety Analysis Report*, HNF-SD-WM-SAR-067, Rev. 1, Fluor Daniel Hanford, Inc., Richland, Washington.

HTWTF, 1993, *Final Report: Hanford Tank Waste Task Force*, Hanford Tank Waste Task Force, funded by Washington State Department of Ecology, U.S. Department of Energy, and U.S. Environmental Protection Agency, Richland, Washington.

Kinzer, J. E., 1997, *Contract Number DE-AC06-96RL13200 – Nuclear Regulatory Commission (NRC) Agreement of Classification of Hanford Tank Wastes* (Letter 9755522 to President, Fluor Daniel Hanford, Inc, June 23, 1997), U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Kirkbride, R. A., R. Potter, J. Garfield, J. Jo, T. Crawford, T. Hohl, B. Higley, and J. Strode, 2000, *Tank Farm Contractor Operation and Utilization Plan*, RPP-SD-WM-SP-012, Rev. 2, CH2M Hill Hanford Group, Inc., Richland, Washington (or latest revision).

Kupfer, M. J., A. L. Boldt, B. A. Higley, K. M. Hodgson, L. W. Shelton, B. C. Simpson, and R. A. Watrous (LMHC), S. L. Lambert, and D. E. Place (SESC), R. M. Orme (NHC), G. L. Borsheim (Borsheim Associates), N. G. Colton (PNNL), M. D. LeClair (SAIC), R. T. Winward (Meier Associates), and W. W. Schulz (W^2S Corporation), 1999, *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Wastes*, HNF-SD-WM-TI-740, Rev. 0C, prepared by Lockheed Martin Hanford Corporation for Fluor Daniel Hanford, Inc., Richland, Washington.

ORP, 2000, *River Protection Project Management Plan*, DOE/ORP-2000-06, Revision 2, U.S. Department of Energy, Office of River Protection, Richland, Washington (or latest revision)

ORP M 411.1, Rev 0, *Safety Management Functions, Responsibilities, and Authorities Manual for U.S. Department of Energy, Office of River Protection*.

Strode, J. N., and V. C. Boyles, 2000, *Operational Waste Volume Projection*, HNF-SD-WM-ER-029, Revision 26, prepared by Lockheed Martin Hanford Corporation for Fluor Daniel Hanford, Inc., Richland, Washington (or latest revision).

APPENDIX A

RIVER PROTECTION PROJECT

SIMPLIFIED PROCESS FLOW DIAGRAM

AND

ESTIMATED MATERIAL QUANTITIES

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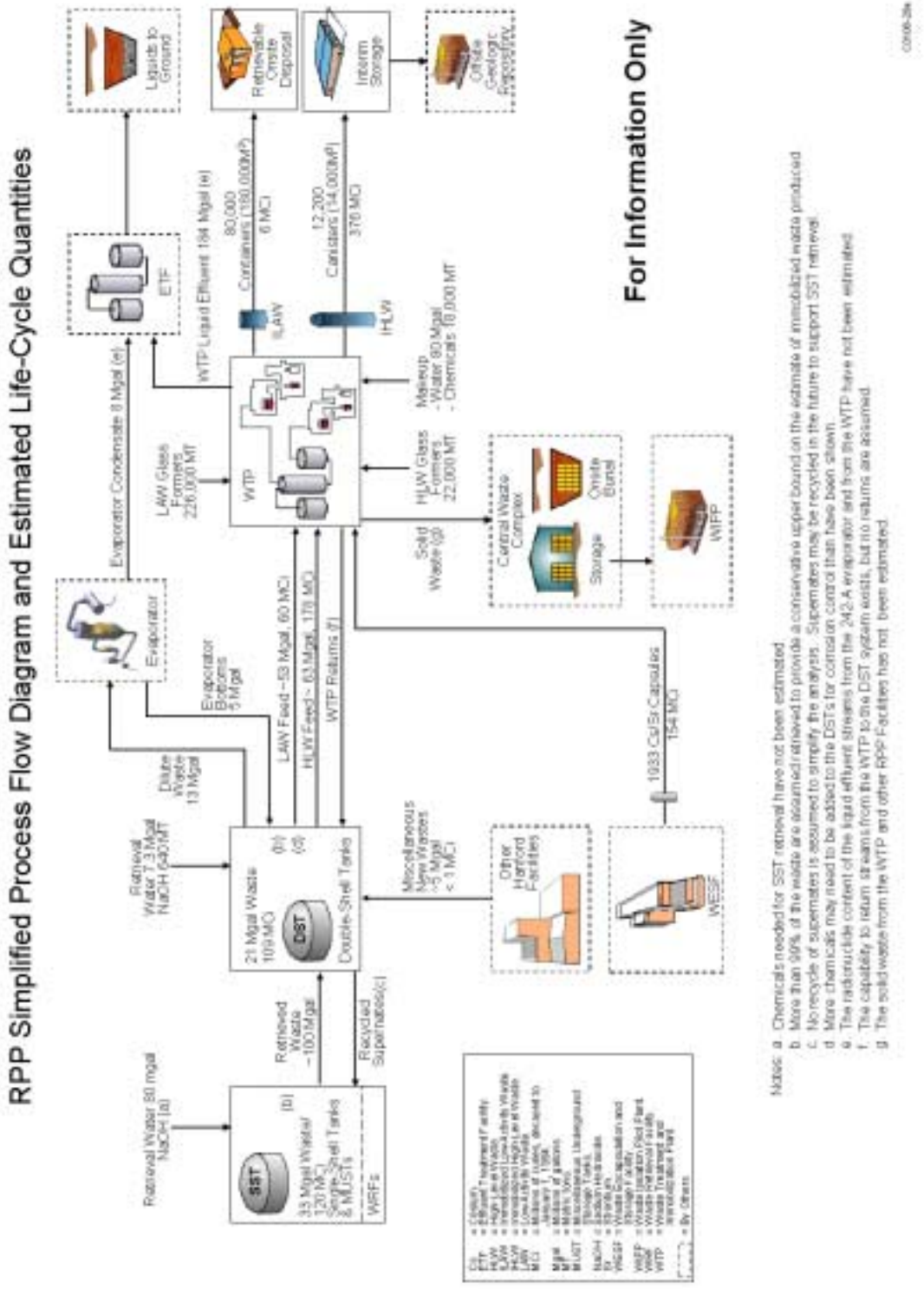
RPP Simplified Process Flow Diagram and Estimated Life-Cycle Quantities



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APPENDIX B

RIVER PROTECTION PROJECT

WORK BREAKDOWN STRUCTURE TO FUNCTIONAL LOGIC MAP

AND

WORK BREAKDOWN STRUCTURE

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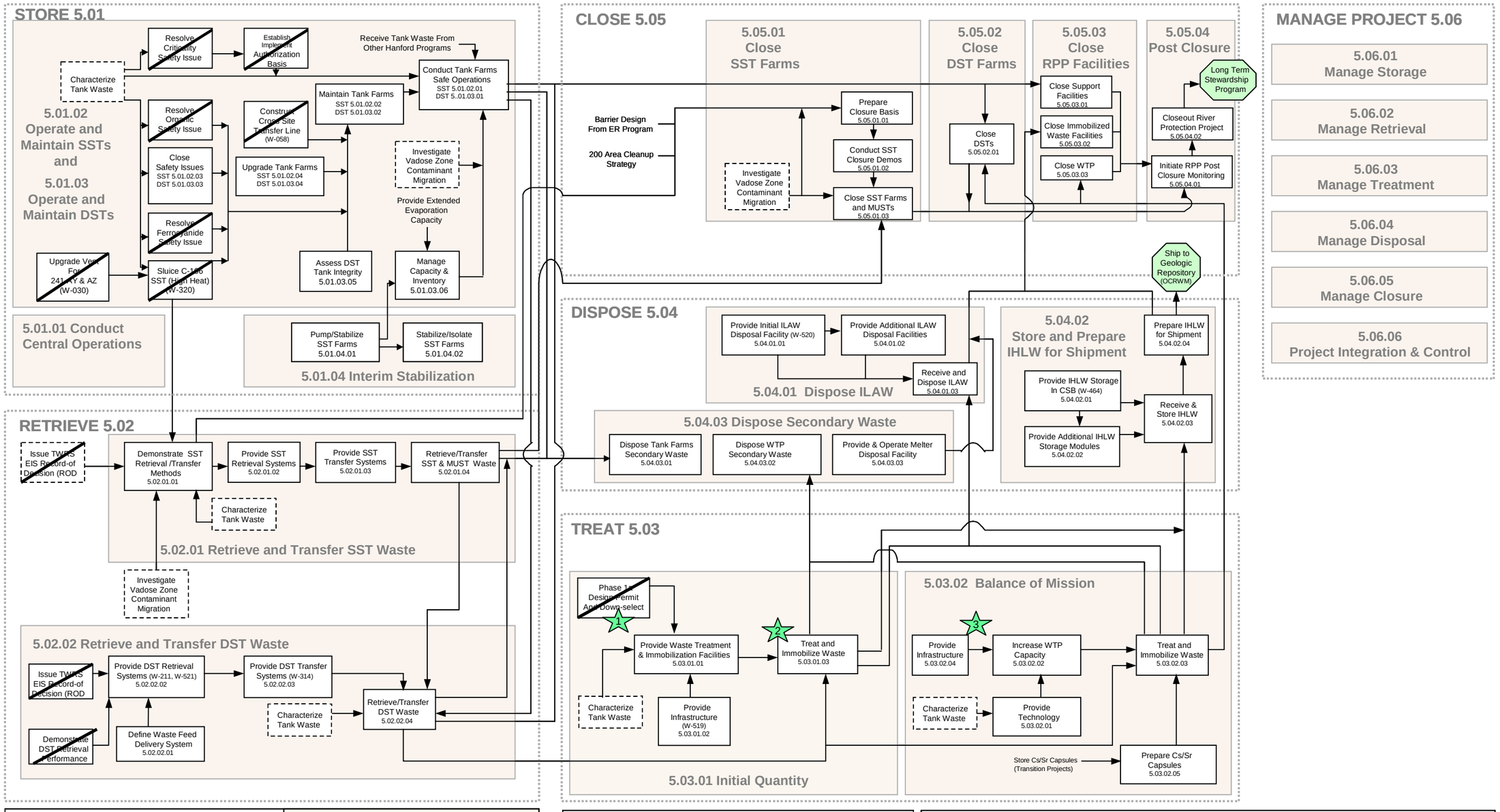
RIVER PROTECTION PROJECT WORK BREAKDOWN STRUCTURE TO FUNCTIONAL LOGIC MAP



LEGEND

Upgrade Tank Farms (W-314) 5.01.01.04 — Function; Capital Project; WBS Number

Long Term Stewardship — Terminal Objective

Activity Complete

Important Subactivity supporting several functions

EIS ROD RE-EVALUATION POINTS

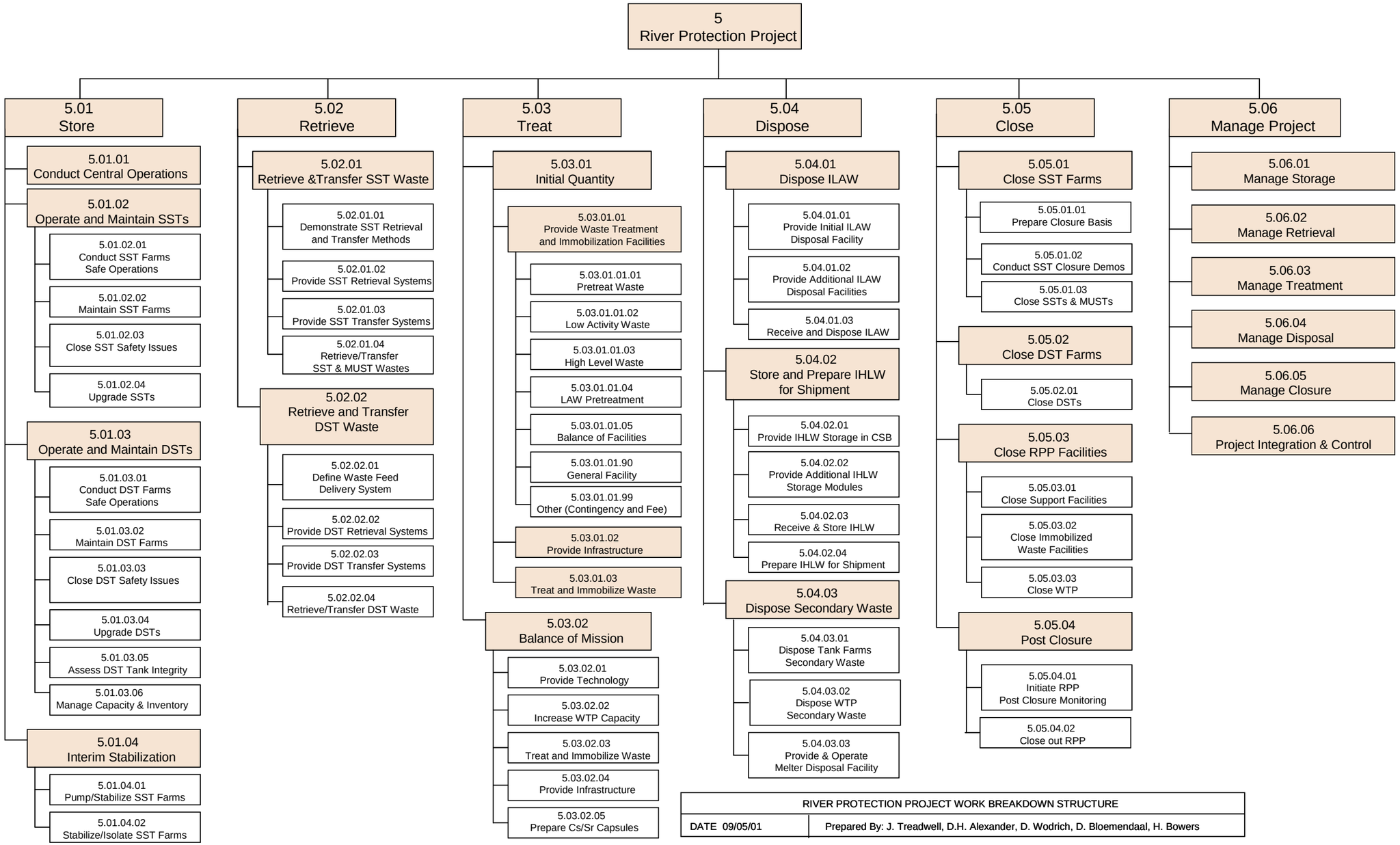
1. Prior to proceeding with Phase 1b
2. Prior to Phase 1 Hot Operations
3. Prior to proceeding with Balance of Mission

ACRONYM LIST

CSB	Canister Storage Building	MUST	Miscellaneous Underground Storage Tank
D&D	Decontaminate and Decommission	OCRWM	Office of Civilian Radioactive Waste Management
DST	Double Shell Tank	ORP	Office of River Protection
EIS	Environmental Impact Statement	ROD	Record of Decision
ER	Environmental Restoration	RPP	River Protection Project
HLW	High-Level Waste	SST	Single-Shell Tank
IHLW	Immobilized High-Level Waste	TWRS	Tank Waste Remediation System
ILAW	Immobilized Low-Activity Waste	WTP	Waste Treatment & immobilization Plant
LAW	Low Activity Waste		

RIVER PROTECTION PROJECT WBS TO FUNCTIONAL LOGIC MAP	
DATE 9/05/01	Prepared By: J. Treadwell, D.H. Alexander, D. Wodrich, D. Bloemendaal, H. Bowers

RIVER PROTECTION PROJECT WORK BREAKDOWN STRUCTURE



APPENDIX C

RIVER PROTECTION PROJECT

SYSTEM REQUIREMENTS

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Appendix C

River Protection Project System Requirements

This Appendix contains system requirements (also known as mission or technical requirements) for the RPP mission. These requirements are allocated to each of the functions described in Section 5.0. System requirements define "what" must be accomplished in executing each function and specify conditions for "how well" each function must be performed. System requirements do not specify "how" each function is to be accomplished. Requirements of this nature are referred to as *management requirements*.

System requirements currently exist in various documents. Some documents are externally controlled (e.g., TPA) while others are internally controlled, e.g., specifications for the WTP Contract. Still other requirements can be derived from direction provided to contractors in the form of planning guidance or contract modifications. Ideally, system requirements would be systematically defined and then placed under control in a well-defined set of documents. But, the RPP consists of multiple subprojects in various stages of their evolution. Consequently, requirements have been specified through a variety of mechanisms and are housed in several types of documents. It is ORP's intent to consolidate these requirements into a better-defined structure using this appendix, with appropriate use of "pointers" to existing sets of requirements.

In developing the requirements contained in this Appendix, it is ORP's intent to point to system requirements that are contained in ORP or externally controlled documents. For these situations specific pointers are provided without repeating the requirement itself. Therefore, there is no duplication of a requirement statement that is included in an ORP or externally controlled document. The following guidelines have been applied for the development of the requirements in this Appendix:

- Where existing ORP or externally controlled requirements documents exist, this appendix includes pointers to those documents (e.g., TPA) with specific reference to the nature of the system requirements that are included (e.g., technical specification for completion of SST interim stabilization).

- Requirements in documents that are currently under ORP change control (e.g., Interface Control Documents) are not restated in this appendix.

- Requirements that have been specified through contract direction letters and planning guidance are restated in this appendix to provide a single location for their allocation to RPP functions.

- Requirements in documents that are not currently under ORP change control (e.g., some interface documents and Level 1 specifications) are either restated in this appendix or new ORP-controlled requirements documents are identified as "to be developed".

Table C.0 describes the relationship between existing source documents for ORP system requirements and the tables of requirements contained in this appendix. Tables C-1 through C-5 are intended to provide a complete set of system requirements through a combination of direct statements and pointers to other controlled documents. Tables C.0-1 through C.0-5 provide detailed listings of source documents for ORP system requirements.

Table C.0. Relationship Between Existing Sources Of ORP System Requirements And MARR Appendix C [1]

Category	Existing Documents	Appendix C Relationship
Legal Requirements	Hanford Federal Facility Agreement and Consent Order (HFFACO) *(See Table C.0-1)* [2]	Affected functions include pointers to technical requirements contained in HFFACO Milestone Series, but the MARR does not restate those requirements.
	Tank Integrity Administrative Orders *(See Table C.0-1)* [2]	Affected functions include pointers to technical requirements contained in Administrative Orders, but the MARR does not restate those requirements.
	Interim Stabilization Consent Decree *(See Table C.0-1)* [2]	Affected functions include pointers to technical requirements contained in Consent Decree, but the MARR does not restate those requirements.
Contract Requirements	Tank Farm Contract (DE-AC27-99RL-14047)	For each affected function, the MARR restates technical requirements that are contained in the Tank Farm Contract.
	Waste Treatment Plant Contract (DE-AC27-01RV14136)	For each affected function, the MARR points to specific WTP Contract sections (e.g., Specifications and Standards) for technical requirements, but the MARR does not restate those requirements.
Interface Requirements	ORP shared interface requirements documents (e.g., MOAs and MOUs) *(See Table C.0-2)* [2]	Affected functions include pointers to applicable documents, but MARR does not restate those requirements.
	ORP controlled interface control documents (e.g., ICDs) *(See Table C.0-3)* [2]	Affected functions include pointers to applicable ICDs, but MARR does not restate those requirements.
	Non-ORP controlled interface requirements documents (e.g., contractor developed and controlled documents) *(See Table C.0-4)* [2]	Affected functions include pointers to applicable TBD documents with reference to an existing contractor-controlled document as the current or assumed placeholder, but MARR does not restate those requirements.
Safety and Environmental Requirements	The Tank Farm Contractor Authorization Envelope (Including Authorization Agreement documents) *(See Table C.0-5)* [2]	The TFC safety and environmental requirements are defined by the TFC Authorization Agreement, which identifies the items of significant importance in establishing and supporting the TFC Authorization Envelope. The MARR does not include an additional pointer to these requirements.
	WTP Contractor Safety and Environmental Related Documents *(See Table C.0-5)* [2]	The WTP Contractor safety and environmental requirements and related documents are defined in Standard 7 of the WTP Contract. The MARR does not include an additional pointer to these requirements.
Prior Contract Direction and Planning Guidance	Numerous contract direction letters and planning guidance (e.g., Baseline Update Guidance)	For each affected function, the MARR restates technical requirements that were contained in previously issued contract direction and planning guidance but which have been identified as ORP system requirements.
	Interim planning requirements identified in previous guidance as Key Planning Assumptions	Affected functions include pointers to interim ORP system requirements derived from previous planning guidance and assumptions that are still pending final disposition, but MARR does not restate those requirements. All former Key Planning Assumptions (KPA) are under revision. Until this revision is approved, functions affected by a KPA have a reference to an Interim Requirement - To Be Developed (IR-TBD) with short description.
Capital Project Requirements	ORP-approved design requirements documents for Line Item Projects (e.g., "Design Requirements Documents")	Affected functions include a reference to an implementing capital project but the MARR does not point to associated requirements documents.
Schedule Requirements	Integrated Mission Schedule (DOE/ORP-2001-12) and Expanded Management Summary Schedule (DOE/ORP-2001-13)	The IMS and EMSS include ORP-controlled milestones. There is no pointer to these from the MARR. Schedule requirements are not restated in the MARR.

[1] The Appendix C Relationship indicates where "pointers" are included in the MARR system requirements. These pointers occur throughout the Appendix C system requirements and identify existing documents where requirements for affected functions will be found. This approach is used to minimize repetition and maintain configuration management for single-source documents with cross-cutting requirements. Function managers and others responsible for defining and implementing ORP system requirements must understand and ensure integration of requirements from these referenced sources.

[2] Tables C.0-1, C.0-2, C.0-3, C.0-4, C.0-5, and C.0-6 are at the end of Appendix C.

ORP System Requirements Source Documents Referenced in Table C.0 And Identified By Pointers In Appendix C.

Table C.0-1. Existing legal documents that are sources of ORP system requirements.

HFFACO	Hanford Federal Facility Agreement and Consent Order, 1989, as amended., Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.
ISCD	Consent Decree No. CT-99-5076-EFS, *Interim Stabilization Consent Decree* (ISCD), 1999, as amended, U.S. District Court, Eastern District of Washington
TIAO	Administrative Orders No. 00NWPKW-1250 and 00NWPKW-1251, *Tank Integrity Administrative Orders* (TIAO), 2000, as amended, Washington State Department of Ecology, Olympia, Washington.

Table C.0-2. Existing ORP shared interface documents that are sources of ORP system requirements.

MOA 1	Memorandum of Agreement No. I9-TWR-218, Memorandum of Agreement regarding utilization of Canister Storage Building Vaults 2 and 3 for storage of IHLW
MOA 2	Memorandum of Agreement No. FH-0000853, Memorandum of Agreement between RPP and Spent Nuclear Fuels Program for Canister Storage Building Interfaces
MOA 3	Memorandum of Agreement for Acceptance of Department of Energy Spent Nuclear Fuel and High-Level Radioactive Waste Between the Assistant Secretary for Environmental Management (EM), U.S. Department of Energy (DOE), Washington, D.C., and the Director, Office of Civilian Radioactive Waste Management
MOA 4	Memorandum of Agreement Between Office of Environmental Restoration and Office of Waste Management for the Single-Shell Tank Program, Hanford Site, Richland, Washington
MOA 5	Memorandum of Agreement Between The Richland Operations Office and The Office of River Protection for Interface Management
MOU 1	Memorandum of Understanding No. RFSH-9656620.2, Memorandum of Understanding between Liquid Waste Processing Facilities and 200 East Tank Farms

Table C.0-3. Existing ORP controlled interface control documents that are sources of ORP system requirements.

ICD 1	BNFL-5193-ID-1, *Interface Control Document Between DOE and BNFL Inc. for Raw Water* , BNFL Inc., Richland, Washington.
ICD 2	BNFL-5193-ID-2, *Interface Control Document Between DOE and BNFL Inc. for Potable Water* , BNFL Inc., Richland, Washington.
ICD 3	BNFL-5193-ID-3, *Interface Control Document Between DOE and BNFL Inc. for Radioactive Solid Wastes* , BNFL Inc., Richland, Washington.
ICD 4	BNFL-5193-ID-4, *Interface Control Document Between DOE and BNFL Inc. for Dangerous Wastes* , BNFL Inc., Richland, Washington.
ICD 5	BNFL-5193-ID-5, *Interface Control Document Between DOE and BNFL Inc. for Non-Radioactive, Non-Dangerous Liquid Effluents* , BNFL Inc., Richland, Washington.
ICD 6	BNFL-5193-ID-6, *Interface Control Document Between DOE and BNFL Inc. for Radioactive, Dangerous Liquid Effluents* , BNFL Inc., Richland, Washington.
ICD 8	BNFL-5193-ID-8, *Interface Control Document Between DOE and BNFL Inc. for Liquid Sanitary Wastes* , BNFL Inc., Richland, Washington.
ICD 9	BNFL-5193-ID-9, *Interface Control Document Between DOE and BNFL Inc. for Land for Siting* , BNFL Inc., Richland, Washington.
ICD 11	BNFL-5193-ID-11, *Interface Control Document Between DOE and BNFL Inc. for Electricity* , BNFL Inc., Richland, Washington.
ICD 12	BNFL-5193-ID-12, *Interface Control Document Between DOE and BNFL Inc. for Roads* , BNFL Inc., Richland, Washington.
ICD 14	BNFL-5193-ID-14, *Interface Control Document Between DOE and BNFL Inc. for Immobilized High-Level Waste* , BNFL Inc., Richland, Washington.
ICD 15	BNFL-5193-ID-15, *Interface Control Document Between DOE and BNFL Inc. for Immobilized Low-Activity Waste* , BNFL Inc., Richland, Washington.
ICD 16	BNFL-5193-ID-16, *Interface Control Document Between DOE and BNFL Inc. for Entrained Solids* , BNFL Inc., Richland, Washington.

ICD 19	BNFL-5193-ID-19, *Interface Control Document Between DOE and BNFL Inc. for Low-Activity Waste Feed*, BNFL Inc., Richland, Washington.
ICD 20	BNFL-5193-ID-20, *Interface Control Document Between DOE and BNFL Inc. for High-Level Waste Feed* , BNFL Inc., Richland, Washington.
ICD 23	BNFL-5193-ID-23, *Interface Control Document Between DOE and BNFL Inc. for Waste Treatability Samples* , BNFL Inc., Richland, Washington.
ICD 25	BNFL-5193-ID-25, *Interface Control Document Between DOE and BNFL Inc. for Emergency Response* , BNFL Inc., Richland, Washington.
ICD 27	BNFL-5193-ID-27, *Interface Control Document Between DOE and BNFL Inc. for Telecommunications,* BNFL Inc., Richland, Washington.

Table C.0-4. Existing non-ORP controlled interface documents that are sources of ORP system requirements.

HNF-3394	HNF-3394, *Interface Control Document Between the Double Shell Tanks (DST) System and T-Plant* , Numatec Hanford Company, Richland, Washington
HNF-3395	HNF-3395, I*nterface Control Document Between the Double Shell Tanks (DST) System and the 242-A Evaporator Facility* , CH2MHILL Hanford Group, Inc., Richland Washington
HNF-3396	HNF-3396, *Interface Control Document Between the Double-Shell Tanks (DST) System and the Waste Encapsulation and Storage Facility (WESF)* , CH2MHILL Hanford Group, Inc., Richland Washington
HNF-3404	HNF-3404, *Interface Control Document Between the Double Shell Tanks (DST) System and Building 325* , Numatec Hanford Company, Richland, Washington
HNF-4482	HNF-4482, *Interface Control Document Between the Tank Farm System and the Central Waste Complex (CWC) or the Low-Level Burial Ground* , Numatec Hanford Company, Richland, Washington
HNF-4483	HNF-4483, *Interface Control Document Between the Tank Farm System and 222-S Laboratory* , Numatec Hanford Company, Richland, Washington
HNF-4486	HNF-4486, *Interface Control Document Between the Double-Shell Tanks (DST) System and the Plutonium Finishing Plant (PFP)* , Numatec Hanford Company, Richland, Washington
HNF-4489	HNF-4489, *Interface Control Document Between the Double Shell Tank (DST) System and Building 324* , Numatec Hanford Company, Richland, Washington
HNF-SD-W049H-ICD-001	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document* , Rust Federal Services Hanford Inc., Richland, Washington
RPP-7527	RPP-7527, *Interface Control Document Between the Double-Shell Tank System and the 340 Waste Handling Facility* , CH2MHILL Hanford Group, Inc., Richland Washington
RPP-7528	RPP-7528, *Interface Control Document Between the Double-Shell Tank System and Building 327* , CH2MHILL Hanford Group, Inc., Richland Washington
Placeholder	TBD, electrical power system requirements for RPP mission needs (currently assumed to be a forthcoming document, HNF-4492).
Placeholder	TBD, raw and potable water system requirements for RPP mission needs (currently assumed to be a forthcoming document, HNF-4493).

Table C.0-5. Existing safety, health, and environmental documents that are sources of ORP system requirements.

Tank Farm Authorization Envelope	The Tank Farm Authorization Envelope is documented (with ORP concurrence) in CHG-5980, and consists of: · The TFC Authorization Basis, including HNF-SD-WM-SAR-067, Tank Waste Remediation System Final Safety Analysis Report (FSAR), and HNF-SD-WM-TSR-006, Tank Waste Remediation System Technical Safety Requirements (TSR) · The TFC requirements basis, including HNF-SD-MP-SRID-001, Tank Waste Remediation System Standards/Requirements Identification Document (S/RID) · The RPP environmental permits (HNF-4474) and National Environmental Policy Act (NEPA) documents (TWRS EIS, ROD, and Supplement Analyses), and · Tank Farm health and safety requirements, including HNF-SD-WM-HSP-002, Tank Farm Health and Safety Plan (HASP)
WTP Contractor Safety and Environmental Requirements	DE-AC27-01RV14136, *Design and Construction of the Hanford Tank Waste Treatment and Immobilization Plant* , U.S. Department of Energy, Office of River Protection, Richland, Washington; Section C.6, Standards, Standard 7: Environment, Safety, Quality, and Health

Reference Documents for RPP System Requirements	
Ref. No.	**Document Name**
Authorization Agreement	CHG-5980, Rev 0, *River Protection Project Authorization Agreement between U.S. Department of Energy, Office of River Protection and CH2M HILL Hanford Group, Inc.*, and any approved amendments. Includes: HNF-SD-WM-SAR-067, Rev 1, *Tank Waste Remediation System Final Safety Analysis Report (FSAR)*, and any approved amendments; and HNF-SD-WM-TSR-006, Rev 1, *Tank Waste Remediation System Technical Safety Requirements (TSR)*, and any approved amendments.
BUG 1999	Correspondence No. 9954322 A, from Klein, K.A., and R.T. French, to R.D. Hanson, Correspondence No. 99-DBD-015, from Leif Erickson to R.D. Hanson, and Correspondence No. 99-AMPD-006, from W.J. Taylor to R.D. Hanson, communicating Baseline Updating Guidance (BUG) for Fiscal Year 2000 (FY2000) Multi-Year Work Plan (MYWP), 1999, U.S. Department of Energy, Office of River Protection, Richland, Washington.
CHG 1999	HNF-3912, Rev 0, *System Specification for the Single-Shell Tank System*, 1999, CH2MHill Hanford Group, Richland, Washington.
CHG 2000	HNF-SD-WM-TRD-007, Rev. 0, *System Specification for the Double-Shell Tank System*, 2000, CH2MHill Hanford Group, Richland, Washington.
DOE 435.1	DOE O 435.1 and DOE M 435.1.
HEMP	DOE/RL-94-02, Rev. 2, *Hanford Emergency Management Plan*, U.S. Department of Energy, Richland, Washington
HFFACO	*Hanford Federal Facility Agreement and Consent Order*, 1986, as amended., Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.
HNF-3394	HNF-3394, *Interface Control Document Between the Double Shell Tanks (DST) System and T-Plant*, Rev. 0, 1999, Numatec Hanford Company, Richland, Washington
HNF-3395	HNF-3395, I*nterface Control Document Between the Double Shell Tanks (DST) System and the 242-A Evaporator Facility*, Rev. 0, 2000, CH2MHILL Hanford Group, Inc., Richland Washington
HNF-3396	HNF-3396, *Interface Control Document Between the Double-Shell Tanks (DST) System and the Waste Encapsulation and Storage Facility (WESF)*, Rev. 0, 2000, CH2MHILL Hanford Group, Inc., Richland Washington
HNF-3404	HNF-3404, *Interface Control Document Between the Double Shell Tanks (DST) System and Building 325*, Rev. 0, 1999, Numatec Hanford Company, Richland, Washington
HNF-4482	HNF-4482, *Interface Control Document Between the Tank Farm System and the Central Waste Complex (CWC) or the Low-Level Burial Ground*, Rev. 0, 1999, Numatec Hanford Company, Richland, Washington
HNF-4483	HNF-4483, *Interface Control Document Between the Tank Farm System and 222-S Laboratory*, Rev. 0, 1999, Numatec Hanford Company, Richland, Washington
HNF-4486	HNF-4486, *Interface Control Document Between the Double-Shell Tanks (DST) System and the Plutonium Finishing Plant (PFP)*, Rev. 0, 1999, Numatec Hanford Company, Richland, Washington
HNF-4489	HNF-4489, *Interface Control Document Between the Double Shell Tank (DST) System and Building 324*, Rev. 0, 1999, Numatec Hanford Company, Richland, Washington
HNF-SD-W049H-ICD-001	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*, Rev. 5A, 1998, Rust Federal Services Hanford Inc., Richland, Washington
ICD 1	BNFL-5193-ID-1, 1998, *Interface Control Document Between DOE and BNFL Inc. for Raw Water*, BNFL Inc., Richland, Washington.
ICD 2	BNFL-5193-ID-2, 1998, *Interface Control Document Between DOE and BNFL Inc. for Potable Water*, BNFL Inc., Richland, Washington.
ICD 3	BNFL-5193-ID-3, 1998, *Interface Control Document Between DOE and BNFL Inc. for Radioactive Solid Wastes*, BNFL Inc., Richland, Washington.
ICD 4	BNFL-5193-ID-4, 1998, *Interface Control Document Between DOE and BNFL Inc. for Dangerous Wastes*, BNFL Inc., Richland, Washington.
ICD 5	BNFL-5193-ID-5, 1998, *Interface Control Document Between DOE and BNFL Inc. for Non-Radioactive, Non-Dangerous Liquid Effluents*, BNFL Inc., Richland, Washington.

ICD 6	BNFL-5193-ID-6, 1998, *Interface Control Document Between DOE and BNFL Inc. for Radioactive, Dangerous Liquid Effluents* , BNFL Inc., Richland, Washington.
ICD 8	BNFL-5193-ID-8, 1998, *Interface Control Document Between DOE and BNFL Inc. for Liquid Sanitary Wastes* , BNFL Inc., Richland, Washington.
ICD 9	BNFL-5193-ID-9, 1998, *Interface Control Document Between DOE and BNFL Inc. for Land for Siting* , BNFL Inc., Richland, Washington.
ICD 11	BNFL-5193-ID-11, 1998, *Interface Control Document Between DOE and BNFL Inc. for Electricity* , BNFL Inc., Richland, Washington.
ICD 12	BNFL-5193-ID-12, 1998, *Interface Control Document Between DOE and BNFL Inc. for Roads* , BNFL Inc., Richland, Washington.
ICD 14	BNFL-5193-ID-14, 1998, *Interface Control Document Between DOE and BNFL Inc. for Immobilized High-Level Waste* , BNFL Inc., Richland, Washington.
ICD 15	BNFL-5193-ID-15, 1998, *Interface Control Document Between DOE and BNFL Inc. for Immobilized Low-Activity Waste* , BNFL Inc., Richland, Washington.
ICD 16	BNFL-5193-ID-16, 1998, *Interface Control Document Between DOE and BNFL Inc. for Entrained Solids* , BNFL Inc., Richland, Washington.
ICD 19	BNFL-5193-ID-19, 1998, *Interface Control Document Between DOE and BNFL Inc. for Low-Activity Waste Feed*, BNFL Inc., Richland, Washington.
ICD 20	BNFL-5193-ID-20, 1998, *Interface Control Document Between DOE and BNFL Inc. for High-Level Waste Feed* , BNFL Inc., Richland, Washington.
ICD 23	BNFL-5193-ID-23, 1998, *Interface Control Document Between DOE and BNFL Inc. for Waste Treatability Samples* , BNFL Inc., Richland, Washington.
ICD 25	BNFL-5193-ID-25, 1998, *Interface Control Document Between DOE and BNFL Inc. for Emergency Response* , BNFL Inc., Richland, Washington.
ICD 27	BNFL-5193-ID-27, 1998, *Interface Control Document Between DOE and BNFL Inc. for Telecommunications,* BNFL Inc., Richland, Washington.
ISCD	Consent Decree No. CT-99-5076-EFS, *Interim Stabilization Consent Decree* (ISCD), 1999, as amended, U.S. District Court, Eastern District of Washington
Kinzer 1997	Nuclear Regulatory Commission letter, "Classification of Hanford Low Activity Waste Fraction," Carl Paperiello to Jackson Kinzer, dated June 9, 1997.
MOA 1996	Memorandum of Agreement No. I9-TWR-218, Memorandum of Agreement regarding utilization of Canister Storage Building Vaults 2 and 3 for storage of IHLW, April 15, 1996
MOA 2000	Memorandum of Agreement No. FH-0000853, Memorandum of Agreement between RPP and Spent Nuclear Fuels Program for Canister Storage Building Interfaces, February 17, 2000
MOU 1997	Memorandum of Understanding No. RFSH-9656620.2, Memorandum of Understanding between Liquid Waste Processing Facilities and 200 East Tank Farms, February 5, 1997
ORP 2001	Preliminary agreement (undocumented) between Office of River Protection and Washington Department of Ecology.
Poppiti 1999	Correspondence No. 99-DBD-092, from James A. Poppiti to M.P. DeLozier, communicating planning guidance for FY2000 MYWP baseline update efforts, 1999, U.S. Department of Energy, Office of River Protection, Richland, Washington.
RPP MAR, Rev. 0	DOE/ORP-2000-10, Rev 0, *River Protection Project Mission Analysis Report*
RPP-7527	RPP-7527, *Interface Control Document Between the Double-Shell Tank System and the 340 Waste Handling Facility* , Rev. 0, 2001, CH2MHILL Hanford Group, Inc., Richland Washington
RPP-7528	RPP-7528, *Interface Control Document Between the Double-Shell Tank System and Building 327* , Rev. 0, 2001, CH2MHILL Hanford Group, Inc., Richland Washington
RPP-KPA 2000	RPP-5993, *River Protection Project Key Planning Assumptions* , Revision 3, 2000, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
SIS EIS	DOE/EIS-0212, Safe Interim Storage of Hanford Tank Wastes, Final Environmental Impact Statement, Hanford Site, Richland, Washington
TFC 2001	DE-AC27-99RL14047, 2001, *CH2M HILL Hanford Group, Inc., Contract* , U.S. Department of Energy, Office of River Protection, Richland, Washington.

TFC PI-05	DE-AC27-99RL14047, 2001, *CH2M HILL Hanford Group, Inc., Contract* (TFC 2001), Section J, Appendix D, Performance Incentive Number ORP-05, Revision No. 0, January 16, 2001, *Single-Shell Tank Interim Stabilization* .
TFC PI-08	DE-AC27-99RL14047, 2001, *CH2M HILL Hanford Group, Inc., Contract* (TFC 2001), Section J, Appendix D, Performance Incentive Number ORP-08, Revision No. 0, January 16, 2001, *Facility Stabilization* .
TFC PI-09	DE-AC27-99RL14047, 2001, *CH2M HILL Hanford Group, Inc., Contract* (TFC 2001), Section J, Appendix D, Performance Incentive Number ORP-09, Revision No. 0, January 16, 2001, *Life Cycle Asset Management* .
TFC PI-10	DE-AC27-99RL14047, 2001, *CH2M HILL Hanford Group, Inc., Contract* (TFC 2001), Section J, Appendix D, Performance Incentive Number ORP-10, Revision No. 0, January 16, 2001, *Double-Shell Tank Integrity Assessment Reports* .
TFC PI-11	DE-AC27-99RL14047, 2001, *CH2M HILL Hanford Group, Inc., Contract* (TFC 2001), Section J, Appendix D, Performance Incentive Number ORP-11, Revision No. 0, January 16, 2001, *242-A Evaporator Life Cycle Asset Management* .
TFC PI-15	DE-AC27-99RL14047, 2001, *CH2M HILL Hanford Group, Inc., Contract* (TFC 2001), Section J, Appendix D, Performance Incentive Number ORP-15, Revision No. 0, January 16, 2001, *Corporate Performance (Comprehensive)* .
TFC PI-19	DE-AC27-99RL14047, 2001, *CH2M HILL Hanford Group, Inc., Contract* (TFC 2001), Section J, Appendix D, Performance Incentive Number ORP-19, Revision No. 0, January 16, 2001, *Double-Shell Tank Caustic Addition* .
TIAO	Administrative Orders No. 00NWPKW-1250 and 00NWPKW-1251, 2000, *Tank Integrity Administrative Orders* (TIAO), Washington State Department of Ecology, Olympia, Washington.
TWRS EIS	DOE/EIS 0189, Tank Waste Remediation System, Hanford Site, Richland, Washington, Final Environmental Impact Statement
TWRS EIS ROD	62 Federal Register (FR) 8693, *Record of Decision for the Tank Waste Remediation System* , Hanford Site, Richland, Washington, issued February 27, 1997.
TWRS S/RIDs	HNF-SD-MP-SRID-001, Rev 2, *Tank Waste Remediation System Standards/ Requirements Identification Document (S/RID)* , and any approved amendments
TWRS-P 1998	DE-AC06-96RL13308, 1998, *TWRS Privatization Contract* , U.S. Department of Energy, Richland Operations Office, Richland, Washington.
WTP 2000	DE-AC27-01RV14136, 2000, *Design and Construction of the Hanford Tank Waste Treatment and Immobilization Plant* , U.S. Department of Energy, Office of River Protection, Richland, Washington.

ORP System Requirements for Store (Function 5.01)			Function (WBS Element has same number)																
ID #	Requirement Key: BOLD = To Be Developed Requirement; *BOLD ITALIC = Placeholder pending formal definition*	Source	5.01.01		5.01.02.01	5.01.02.02	5.01.02.03	5.01.02.04		5.01.03.01	5.01.03.02	5.01.03.03	5.01.03.04	5.01.03.05	5.01.03.06		5.01.04.01	5.01.04.02
S-1	**Tank Farms Operations and Maintenance.** Adequately perform operations and maintenance. Receive HLW within the waste acceptance criteria into the DST system from Hanford Site facilities as required to support the Hanford Site cleanup mission. Until all waste is retrieved, the DSTs must function to store and prepare waste retrieved from SSTs and MUSTs for waste treatment facilities while optimizing utilization of DST space. Effectively manage tank space to maximize capacity for Hanford Site and ORP requirements.	TFC 2001, Sections C.3(a)(1)(i) and (a)(2)(i), and TFC Performance Incentive (PI) -15		X		X	X				X	X				X			
S-2	**Upgrade Tank Farms.** Upgrade Tank Farms to support safe and reliable operation and tank waste retrieval, staging and delivery efforts, improve infrastructure reliability, operability and maintainability (including upgrades to transfer systems, instrumentation and control systems, electrical distribution and ventilation systems), and address remaining actions under Milestone Series Number M-43-00 of the HFFACO (see Table C.0-1). Portions of capital line item Projects W-211 and W-314 implement some of the required upgrades.	TFC 2001, Section C.3(a)(1)(ii), and HFFACO				X	X	X			X	X	X					
S-3	**Upgrade 242-A Evaporator.** Complete 242-A Evaporator upgrade construction. Enhance the reliability of the 242-A Evaporator to extend the life of the facility to 2016.	TFC 2001, Section C.3(a)(1)(iv), and TFC PI-11								X	X							
S-4	**Maintain Tank Farms.** Maintain Tank Farms waste and infrastructure in a safe and stable configuration. Manage and maintain Tank Farm equipment and infrastructure to meet current and future operational use needs. Enhance the reliability of Tank Farm equipment, and evaluate the capability of that equipment to support long-term missions.	TFC 2001, Sections C.1 and C.3(a)(1)(iv), and TFC PI-09		X		X				X								
S-5	**Waste Feed Returns**. Install infrastructure to receive entrained solids and out-of-specification feed from the WTP. Provide capability to receive one million gallons of emergency returns. Accept waste returns from the WTP that meet tank farm pumpability and storage criteria. Anticipate an **IR-TBD** to define, plan for and enable acceptance and future processing of out-of-specification waste feed.	BUG 1999, and RPP-KPA 2000		X							X		X		X			
S-6	**SST Interim Stabilization and Isolation.** Initiate and complete saltwell pumping and interim stabilization of SSTs. Remove pumpable liquids from the SSTs and transfer to DSTs to reduce environmental risk. Cap or plug entry points into stabilized SSTs as required such that waste and water will not re-enter the tank. Complete interim stabilization and interim isolation of SSTs and address remaining actions under Milestone Series Number M-41-00 of the HFFACO and in accordance with the Interim Stabilization Consent Decree (see Table C.0-1).	TFC 2001, Sections C.3(a)(1)(iii) and (iv), TFC PI-05, HFFACO, and ISCD															X	X
S-7	**SST Tank System Integrity.** Perform SST integrity assessments, surveillance, installation of liquid observation wells, monitoring, and reporting in accordance with **TBD** ***[Assumed to be specified in forthcoming additions to Milestone Series Number M-23-00 of the HFFACO]*** (see Table C.0-1).	HFFACO		X		X			X									
S-8	**DST Capacity and Available Space Allocation**. Prepare reports and information and support negotiations with Ecology and EPA regarding provision of additional DST capacity and acquisition of additional tanks, and address remaining actions in accordance with Milestone Series Number M-42-00 and M-46-00 of the HFFACO (see Table C.0-1). Anticipate an **IR-TBD** to define, plan for, allocate, and use available DST space.	HFFACO, and RPP-KPA 2000				X				X					X			
S-9	**DST Caustic Additions**. Adjust DST waste pH to meet operational specifications. Anticipate an **IR-TBD** to define, plan for and perform tank waste chemical adjustments to mitigate waste corrosivity risks.	TFC 2001, Section C.3(a)(1)(iv), TFC PI-19, and RPP-KPA 2000		X						X	X	X			X			
S-10	**DST Tank System Integrity.** Perform DST integrity testing and reporting in accordance with State of Washington Administrative Orders 00NWPKW-1250 and 1251, Tank Integrity Administrative Orders, and **TBD** ***[Assumed to be specified in proposed new Milestone Series Number M-48-00 of the HFFACO]*** (see Table C.0-1).	TFC 2001, Section C.3(a)(1)(iv), and TFC PI-10		X						X				X				
S-11	**Tank Waste Inventory.** Use the Best Basis Inventory (BBI) as the common basis for the tank waste inventory.	RPP-KPA 2000		X		X				X					X			
S-12	**Tank Waste Sampling and Characterization**. Perform waste sampling and characterization as required to assure safe storage conditions. Perform waste monitoring, characterization, and reporting as required to meet regulatory requirements. Provide tank characterization and waste samples to support WTP planning and testing requirements, and support for development of the RPP Flowsheet. Provide tank waste samples from staged waste feed tanks to the WTP for permitting and licensing testing purposes.	TFC 2001, Sections C.1, C.3(a)(1)(i) and (iv), and RPP-KPA 2000		X		X	X			X	X				X			
S-13	**RPP Process Flowsheet.** Support development of the RPP flowsheet and planning of all process steps and systems in the Waste Treatment Complex, including improving the quality of input data, developing flowsheet assumptions, identifying inputs and outputs at each step, and developing constraints/requirements at each step.	TFC 2001, Section C.3(a)(2)(iii)		X		X				X					X			
S-14	**Interface System Requirements.** Implement system requirements applicable to safe storage and waste acceptance specified in ICDs 16, 23, 25, and 27 for interfaces between the Tank Farms and WTP (see Table C.0-3). Implement system requirements applicable to safe storage and waste acceptance specified in interface agreements, including MOU 1 (see Table C.0-2), and in **TBD** ***[Assumed to be specified in a future ORP-controlled document to incorporate relevant requirements from contractor documents]*** for interfaces between RPP and other Hanford facilities overseen by DOE-RL (see Table C.0-4).	ICDs 16, 23, 25 and 27, MOU 1, and [Placeholder]		X		X	X		X		X	X		X	X	X			
S-15	**Environmental, Safety, and Health System Requirements.** Implement system requirements applicable to safe storage and waste acceptance specified in environmental, safety, and health agreements within Tank Farms, including the Authorization Envelope, and to ensure safe and compliant interfaces with the WTP (see Table C.0-5).	Authorization Agreement, WTP 2000		X		X	X	X	X		X	X	X	X	X	X		X	X

ORP System Requirements for Retrieve (Function 5.02)			Function (WBS Element has same number)								
ID #	Requirement Key: BOLD = To Be Developed Requirement; *BOLD ITALIC = Placeholder pending formal definition*	Source		5.02.01.01	5.02.01.02	5.02.01.03	5.02.01.04		5.02.02.01	5.02.02.02	5.02.02.03	5.02.02.04
R-1	**Upgrade Tank Farms.** Upgrade tank farms to support safe and reliable operation and tank waste retrieval, staging and delivery efforts, and address remaining actions under Milestone Series Number M-43-00 of the HFFACO (see Table C.0-1).	**TFC 2001, Section C.1, and HFFACO**		X	X	X			X	X	X	
R-2	**SST Retrieval Activities.** Design, install, and complete SST retrieval activities and technology demonstrations; support transition and closure of SSTs and tank farms; update the SST retrieval-sequence document annually, prepare a report of options to increase available space for SST waste retrieval, and prepare annual progress reports on leak detection, monitoring and mitigation (LDMM) activities in accordance with Milestone Series Number M-45-00 of the HFFACO (see Table C.0-1).	**HFFACO, TFC 2001, Section C.3(a)(2)(ii)**		X	X	X	X		X	X	X	X
R-3	**Initial Waste Feed Construction Activities.** Start construction and complete startup and turnover of the waste retrieval and transfer systems for the initial HLW and LAW feeds; build waste transfer pipelines to the WTP site boundary and provide connections to the WTP in accordance with ICDs 19 and 20 (see Table C.0-3), and Milestone Series M-47 of the HFFACO (see Table C.0-1).	**HFFACO**							X	X	X	X
R-4	**Support WTP Operations.** Retrieve and deliver waste feed to support hot commissioning, startup, and completion of WTP pretreatment processing and vitrification of tank wastes in accordance with Milestone Series Number M-62-00 of the HFFACO (see Table C.0-1).	**HFFACO**		X	X	X	X		X	X	X	X
R-5	**Meet Tank Closure Requirements.** Retrieve tank waste to the extent needed for closure in accordance with the requirements of Appendix C.5 of this MARR. Develop methods, systems and requirements for retrieving wastes from the SSTs to the extent needed to close them in accordance with RCRA and the AEA.	**TFC 2001, and DOE 435.1**		X	X	X	X		X	X	X	X
R-6	**Effectively Utilize DST Space.** Use the DSTs to store and prepare waste retrieved from SSTs and MUSTs for processing in the WTP while optimizing utilization of DST space.	**TFC 2001**		X	X		X		X	X		X
R-7	**SST Retrieval Development Activities.** Conduct SST retrieval demonstrations to develop technologies to retrieve salt cake, hard heel, and other wastes from SSTs; determine technology limitations, retrieval efficiencies, safety and environmental concerns, and cost impacts for SST retrieval systems; evaluate alternative retrieval technologies for SSTs that have leaked or may leak; and support the transition and closure of SSTs and tank farms.	**TFC 2001**		X					X			
R-8	**Flowsheet Support.** Support development of the RPP flowsheet and planning of all process steps and systems in the Waste Treatment Complex, including improving the quality of input data, developing flowsheet assumptions, identifying inputs and outputs at each step, and developing constraints/requirements at each step. Provide tank characterization and waste samples to support WTP planning and testing requirements, and support for development of the RPP Flowsheet.	**TFC 2001**		X			X		X			X
R-9	**Cold-Test Facility.** Acquire a Cold Test, Training, and Mock-up Facility with capabilities to support the near-term needs of the SST Program and Milestone Series Number M-45-00 of the HFFACO (see Table C.0-1), including operator training.	**TFC 2001, and HFFACO**		X			X		X			X
R-10	**System Reliability, Availability, and Maintainability.** Perform analyses to optimize system availability with respect to minimize life-cycle costs. Improve infrastructure reliability, operability, and maintainability (including upgrades to transfer systems, instrumentation and control systems, electrical distribution, and ventilation systems). Install the equipment needed to reliably deliver feed on schedule to the WTP contractor. Ensure at least 80% confidence in meeting the planned waste feed delivery schedule. Ensure that the integrated schedule risk associated with reliability, availability, and maintainability of waste feed delivery does not exceed 2 days per batch *[To Be Refined]* . Maintain systems for retrieving wastes from the DSTs to be operational when required to deliver waste.	**BUG 1999, TFC 2001, and CHG 2000**		X	X	X	X		X	X	X	X
R-11	**Contingency Feed.** Provide contingency feed capability in case the specified sequence cannot be met.	**BUG 1999**		X	X		X		X	X		X
R-12	**Configuration Control.** Maintain configuration control on planned and certified feeds. Do not add to the tanks nor transfer the waste without written ORP concurrence.	**BUG 1999**		X	X	X	X		X	X	X	X
R-13	**Waste Blending.** Strive to blend HLW from different source tanks in the sequence after SY-102 to improve waste loadings in glass (therefore, life-cycle cost-effectiveness). Do not blend wastes from tanks AN-102 and AN-107 with other wastes.	**BUG 1999**		X			X		X			X
R-14	**Data Quality Objectives.** Implement Low-Activity and High-Level Waste Feed Processing Data Quality Objectives, PNNL-12163, in all characterization and planning activities.	**BUG 1999**		X			X		X			X
R-15	**WTP Waste Feed Acceptance Criteria.** Analyze for and demonstrate compliance with WTP waste feed acceptance criteria, per WTP Contract Specifications 7 and 8, and ICDs 19 and 20 (see Table C.0-3).	**BUG 1999, WTP 2000,and ICDs**		X			X		X			X

R-16	**Tank Waste Inventory.** Use the Best Basis Inventory (BBI) as the common basis for the tank waste inventory.	**RPP-KPA 2000**		X	X		X		X	X		X
R-17	**Tank Sequence and Delivery Quantities**. Anticipate an **IR-TBD** to define tank waste sequence and delivery quantities of **IR-TBD** .	**RPP-KPA 2000**		X	X		X		X	X		X
R-18	**Glass Parameters**. Anticipate an **IR-TBD** to define glass product parameters.	**RPP-KPA 2000**		X					X			
R-19	**Ramp-up Rates**. Anticipate an **IR-TBD** to define WTP processing ramp-up rates.	**RPP-KPA 2000**		X	X		X		X	X		X
R-20	**Contingency and Backup Feeds**. Anticipate an **IR-TBD** to define contingency and backup feed conditions.	**RPP-KPA 2000**		X	X		X		X	X		X
R-21	**Chemical Adjustments**. Anticipate an **IR-TBD** to define tank waste chemical adjustment conditions.	**RPP-KPA 2000**							X	X		X
R-22	**Feed Acceptability**. Anticipate an **IR-TBD** to define waste feed acceptability conditions.	**RPP-KPA 2000**		X			X		X			X
R-23	**Treatability and Certification**. Anticipate an **IR-TBD** to define waste treatability and certification timeframes.	**RPP-KPA 2000**		X	X		X		X	X		X
R-24	**Sample Preparation**. Anticipate an **IR-TBD** to define certification sample preparation conditions.	**RPP-KPA 2000**		X			X		X			X
R-25	**Delivery Pipelines**. Anticipate an **IR-TBD** to define waste feed delivery pipeline conditions.	**RPP-KPA 2000**							X		X	
R-26	**Batch Quantity and Delivery Window**. Anticipate an **IR-TBD** to define waste feed batch quantity and delivery window conditions.	**RPP-KPA 2000**							X			X
R-27	**DST Space Availability**. Anticipate an **IR-TBD** to define DST space availability and capacity conditions.	**RPP-KPA 2000**		X					X			X
R-28	**Retrieval Technology Development**. Anticipate an **IR-TBD** to define Balance of Mission retrieval technology conditions.	**RPP-KPA 2000**		X	X							
R-29	**BOM Retrieval**. Anticipate an **IR-TBD** to define Balance of Mission processing rates.	**RPP-KPA 2000**		X	X	X	X		X	X	X	X
R-30	**Initial Quantity LAW Retrieval Equipment and O&M Requirements.** For the Initial Quantity, provide retrieval and transfer equipment and O&M capability for delivery of LAW feeds to the WTP in compliance with: (1) the LAW feed characteristics defined in WTP Contract Specification 7; (2) the hot commissioning requirements defined in WTP Contract Standard 5; ***(3) Anticipate an IR-TBD to define processing ramp-up rates (150%?), with ramp up capped at the specified average annual LAW processing rate defined in Section C.7 of the WTP contract. (Dates for start of ramp up and routine full-scale hot operations are defined on the EMSS.);*** (4) after ramp-up, the average LAW processing rates defined in WTP Contract Section C.7, ***with the installed capability to periodically deliver up to 120%? of the specified average LAW processing rate over any given continuous three-year period during Initial Quantity processing*** ; (5) the LAW feed delivery requirements of ICD 19 (see Table C.0-3); (6) the ordering and scheduling requirements of TBD, assumed to be defined and controlled in ICD 19 (see Table C.0-3) (replaces former Clause H.9 in the BNFL Contract); (7) TBD WTP LAW feed acceptance criteria, and safety, environmental, and operating limits of the WTP for receipt of feed; (8) at a minimum, the amounts and dates necessary to allow WTP treatment and immobilization in accordance with Milestone Series Number M-62-00 of the HFFACO (see Table C.0-1); and (9) the interim requirement **IR-TBD** to provide at least ***[X%]*** extra LAW feed. ***Calculate the X% extra LAW feed using (100 + X)% of the sum of (1) the projected WTP Hot Vitrification Commissioning rampup quantities per IR-TBD, and (2) the projected annual average vitrification processing quantities per Section C.7 of the WTP contract . The (100 + X)% quantity must be at least (100 + X)% of the amount stipulated in TPA M-62-00A and be delivered in time to support the TPA milestone's completion date.***	**WTP 200, RPP-KPA 2000, and ICDs**		X	X	X	X		X	X	X	X

R-31	**Initial Quantity HLW Retrieval Equipment and O&M Requirements.** For the Initial Quantity, provide retrieval and transfer equipment and O&M capability for delivery of HLW feeds to the WTP in conformance with: (1) the HLW feed characteristics defined in WTP Contract Specification 8; (2) the hot commissioning requirements defined in WTP Contract Standard 5; ***(3) 150%? of the processing ramp-up rates defined in IR-TBD, with ramp up capped at the average annual HLW processing rate specified in Section C.7 of the WTP contract. (Dates for start of ramp up and routine full-scale hot operations are defined on the EMSS.);*** (4) after ramp-up, the average HLW processing rates defined in WTP Contract Section C.7, ***with the installed capability to periodically deliver up to 120%? of the specified average HLW processing rate over any given continuous three-year period during Initial Quantity processing*** ; (5) the HLW feed delivery requirements of ICD 20 (see Table C.0-3); (6) the ordering and scheduling requirements of **TBD** ***[Assumed to be defined and controlled in ICD 20]*** (replaces former Clause H.9 in the BNFL Contract); (7) **[TBD]** WTP HLW feed acceptance criteria, and safety, environmental, and operating limits of the WTP for receipt of feed; (8) at a minimum, the amounts and dates necessary to allow WTP treatment and immobilization in accordance with Milestone Series Number M-62-00 of the HFFACO (see Table C.0-1); and (9) the interim requirement **IR-TBD** to provide ***[X%]*** extra HLW feed. ***Calculate the extra HLW feed using (100 + X)% of the sum of (1) the projected WTP Hot Vitrification Commissioning ramp-up quantities per IR-TBD, and (2) the projected annual average vitrification processing quantities per Section C.7 of the WTP contract . The extra quantity must be at least (100 + X)% of the amount stipulated in TPA M-62-00A and be delivered in time to support the TPA milestone's completion date.***	**WTP 200, RPP-KPA 2000, and ICDs**		X	X	X	X		X	X	X	X
R-32	**HLW Solids Loading.** Strive to deliver HLW feed at a high-solids concentration (e.g., 100 g/L). Meet tank farm criteria for avoiding pipeline plugging while satisfying the solids loading requirements of WTP Contract Specification 8.	**BUG 1999, CHG 2000, and WTP 2000**							X			X
R-33	**WTP Waste Returns.** Install infrastructure to receive entrained solids and out-of-specification feed from the WTP. Provide capability to receive 1 M gallons of emergency returns.	**BUG 1999**							X		X	
R-34	**Interface System Requirements.** Implement system requirements applicable to tank waste retrieval and waste feed delivery specified in ICDs 16, 19, 20, 23, 25, and 27 for interfaces between the Tank Farms and WTP (see Table C.0-3). Implement system requirements applicable to safe storage and waste acceptance specified in **TBD** ***[Assumed to be specified in a future ORP-controlled document to incorporate relevant requirements from contractor documents]*** for interfaces between RPP and other Hanford facilities overseen by DOE-RL (see Table C.0-4).	**ICDs 16, 19, 20, 23, 25, 27, and [Placeholder]**		X	X	X	X		X	X	X	X
R-35	**Environmental, Safety, and Health System Requirements.** Implement system requirements applicable to safe waste retrieval and feed delivery specified in environmental, safety, and health agreements within Tank Farms, including the Authorization Envelope, and to ensure safe and compliant interfaces with the WTP (see Table C.0-5).	**Authorization Agreement, WTP 2000**										

ORP System Requirements for Treat (Function 5.03)			Function (WBS Element has same number)									
ID #	Requirement Key: BOLD = To Be Developed Requirement; *BOLD ITALIC = Placeholder pending formal definition*	Source		5.03.01.01	5.03.01.02	5.03.01.03		5.03.02.01	5.03.02.02	5.03.02.03	5.03.02.04	5.03.02.05
T-1	**Treat and Vitrify Initial Quantity.** As an initial quantity (previously referred to as Phase I), pretreat and vitrify no less than 10 percent of Hanford's tank waste by mass and 25 percent by activity, and develop, deploy and operate treatment capability in accordance with **TBD** ***[Assumed to be established in current and forthcoming changes to Milestone Series Number M-62-00 of the HFFACO, see*** *Table C.0-1* ***]*** .	HFFACO			X	X		X	X	X	X	X
T-2	**WTP Design.** The WTP shall meet the process and facility design requirements defined in **the** ***WTP Functional Specification (Deliverable 3.2, WTP Contract), including functional design requirements, inital capacity requirements (including average annual throughput rates), expandability requirements, and required unit operations for pretreatment, LAW vitrification and HLW vitrification, and other technical requirements.]***	WTP 2000		X	X	X						
T-3	**WTP Infrastructure and Operations.** Design, procure, construct, and operate initial quantity infrastructure sufficient to enable the WTP facilities to be constructed and operated in accordance with the WTP Contract. Initial quantity infrastructure shall be designed and constructed to support (but not to provide) the addition of infrastructure needed to increase WTP operational capacities consistent with the expandability requirements of WTP Contract Section C.7.	WTP 2000			X	X						
T-4	**WTP Waste Receipt and Processing.** The WTP shall receive and process tank waste feed in the compositions specified in WTP Contract Specification 7 (LAW envelope), WTP Contract Specification 8 (HLW envelope), and at the quantities and rates specified in WTP Contract Section C.7.	WTP 2000				X						
T-5	**LAW Classification.** Remove radionuclides from the LAW fraction to the extent necessary to qualify the ILAW for disposal as low-level waste in accordance with the method for Waste Incidental to Reprocessing (WIR) determination described in DOE M 435.1-1. ***[To Be Refined -- ILAW has been determined on a preliminary basis by the NRC to be an "incidental" waste (Nuclear Regulatory Commission letter, "Classification of Hanford Low Activity Waste Fraction," Carl Paperiello to Jackson Kinzer, dated June 9, 1997) and will be assumed to be able to qualify as WIR for disposal purposes.]***	Kinzer 1997				X						
T-6	**Toxic Substances Control Act (TSCA) Waste.** Treat tank waste containing polychlorinated biphenyls (PCBs) to produce ILAW and IHLW products that comply with disposal requirements derived from TSCA implementing regulations as specified in **TBD** ***[Assumed to be defined in forthcoming agreements with EPA regarding management of PCB-containing tank waste as PCB remediation waste, and assumed to be consistent with one of two options: 1) treat/dispose in accordance with risk based disposal approval developed using the criteria in 40 CFR 761.61(c); or 2) if non-RCRA regulated, obtain a radioactive waste exemption under 40 CFR 761.50 (b)(7)(ii)]*** .	WTP 2000				X						
T-7	**ILAW Product Criteria.** Remove and/or treat radionuclides and chemicals as necessary to satisfy the ILAW product and regulatory acceptance criteria defined in WTP Contract Specification 2, and treatment standard requirements specified in **TBD** ***[Assumed to be defined in an EPA-approved Petition for a New Treatment Standard for Hanford Tank Waste (Deliverable 7.10, WTP Contract)]*** .	WTP 2000				X						
T-8	**ILAW Product Qualification and Certification.** The ILAW product shall be qualified and certified in accordance with WTP Contract Standard 6.	WTP 2000				X						
T-9	**IHLW Product Criteria.** Remove and/or treat chemicals as necessary to satisfy the IHLW product and regulatory acceptance criteria defined in WTP Contract Specification 1, and the delisting requirements specified in **TBD** ***[Assumed to be defined in an Ecology and EPA approved petition for exemption or exclusion from RCRA and HWMA -- the HLW "delisting" petition (Deliverable 7.9, WTP Contract)]*** .	WTP 2000				X						
T-10	**IHLW Product Qualification and Certification.** The IHLW product shall be qualified and certified in accordance with WTP Contract Standard 6.	WTP 2000				X						

T-11	**Technology Development and Optimization.** Develop technologies and approaches to optimize the completion of the tank waste treatment mission: · Through experience and modifications, increase the capacity and total operating efficiency of the Phase 1 processes and equipment · Through new technology, increase the throughput of the process steps and equipment · Through higher waste loading in the immobilized product reduce the volume of product requiring disposal · Through additional or more efficient processing lines and treatment facilities, increase nameplate capacity · Through treating less waste as a result of risk-based waste removal requirements, complete the mission more cost-effectively. Anticipate an **IR-TBD** to define the target IHLW glass volume from all waste (including initial quantity and Balance of Mission).	**[Placeholder]**				X		X	X			
T-12	**Balance of Mission (BOM) Treatment Capability.** Develop, deploy and operate BOM treatment capability in accordance with the requirements specified in **TBD** ***[Assumed to be defined in forthcoming changes to Milestone Series Number M-62-00 of the HFFACO (see Table C.0-1)]*** .	**TPA**						X	X	X	X	X
T-13	**BOM Treatment and Immobilization Requirements.** Waste feed, treatment and immobilization requirements for the BOM shall be specified in **TBD** ***[Interim assumption is that WTP Contract Specifications will apply to BOM operations]*** .	**[Placeholder]**							X	X		
T-14	**BOM ILAW Production Rate.** The ILAW production target rate during the BOM shall be **TBD** ***[ILAW product is assumed to be a glass waste form, and the glass production target rate is TBD]*** .	**RPP MAR Rev. 0, KPA 2000**							X	X		
T-15	**BOM ILAW Production Rate.** The IHLW production target design rate during the BOM shall be **TBD** ***[IHLW product is assumed to be a vitrified borosilicate glass waste form; the glass production target rate is TBD]***	**RPP MAR Rev. 0, KPA 2000**							X	X		
T-16	**BOM Infrastructure and Secondary Waste Services.** BOM infrastructure and secondary waste service requirements are specified in **TBD** ***[Assumed to be consistent with the requirements specified in the Phase 1 ICDs, including ICDs 1, 2, 3, 4, 5, 6, 8, 9, 11, 12, 25, and 27 (see Table C.0-3), WTP Contract Specification C.9, and IHLW and ILAW design production rates defined in T-14 and T-15]*** .	**RPP MAR Rev. 0, KPA 2000**									X	
T-17	**Cesium/Strontium Capsule Treatment.** Treat cesium/strontium capsules in accordance with **TBD** ***[Treatment and disposal alternative is currently assumed to be immobilization with other HLW at the WTP, and offsite disposal at the geologic repository. Preparation of the cesium and strontium capsules includes removal from WESF, staging of shipments, transport, and any other processing necessary to enable disposal of the capsules. It is assumed that specifications will be developed for management and disposal of the cesium/strontium capsules after supplemental NEPA documentation and record of decision have been issued.]***	**RPP MAR Rev. 0**										X
T-18	**Tank Waste Inventory.** Use the Best Basis Inventory (BBI) as the common basis for the tank waste inventory.	**RPP-KPA 2000**		X		X		X		X		X
T-19	**Tank Sequence and Delivery Quantities.** Anticipate an **IR-TBD** to define tank waste sequence and delivery quantities.	**RPP-KPA 2000**		X		X						
T-20	**Glass Parameters.** Anticipate an **IR-TBD** to define glass product parameters.	**RPP-KPA 2000**		X		X						
T-21	**Ramp-up Rates.** Anticipate an **IR-TBD** to define WTP processing ramp-up rates.	**RPP-KPA 2000**		X		X						

T-22	**Contingency and Backup Feeds.** Anticipate an **IR-TBD** to define contingency and backup feed conditions.	**RPP-KPA 2000**		X		X						
T-23	**Chemical Adjustments.** Anticipate an **IR-TBD** to define tank waste chemical adjustment conditions.	**RPP-KPA 2000**		X		X						
T-24	**Feed Acceptability.** Anticipate an **IR-TBD** to define waste feed acceptability conditions.	**RPP-KPA 2000**		X		X						
T-25	**Treatability and Certification.** Anticipate an **IR-TBD** to define waste treatability and certification timeframes.	**RPP-KPA 2000**		X		X						
T-26	**Sample Preparation.** Anticipate an **IR-TBD** to define certification sample preparation conditions.	**RPP-KPA 2000**		X		X						
T-27	**Entrained Solids.** Anticipate an **IR-TBD** to define entrained solids assumptions and conditions.	**RPP-KPA 2000**		X		X						
T-28	**Delivery Pipelines.** Anticipate an **IR-TBD** to define waste feed delivery pipeline conditions.	**RPP-KPA 2000**		X	X	X						
T-29	**Batch Quantity and Delivery Window.** Anticipate an **IR-TBD** to define waste feed batch quantity and delivery window conditions.	**RPP-KPA 2000**		X		X						
T-30	**LERF/ETF/TEDF.** Anticipate an **IR-TBD** to define LERF, ETF, and TEDF waste transfer and acceptance conditions.	**RPP-KPA 2000**		X	X	X						
T-31	**Failed Melter Disposal.** Anticipate an **IR-TBD** to define conditions for failed melter disposal.	**RPP-KPA 2000**		X	X	X						
T-32	**ILAW Treatment Conditions.** Anticipate an **IR-TBD** to define ILAW treatment conditions.	**RPP-KPA 2000**		X		X						
T-33	**IHLW Treatment Conditions.** Anticipate an **IR-TBD** to define IHLW treatment conditions.	**RPP-KPA 2000**		X		X						
T-34	**BOM Processing.** Anticipate an **IR-TBD** to define Balance of Mission processing rates.	**RPP-KPA 2000**						X	X	X	X	X
T-35	**Interface System Requirements.** Implement system requirements applicable to tank waste treatment and immobilization specified in ICDs 1 through 27 for interfaces between the Tank Farms and WTP (see Table C.0-3). Implement system requirements applicable to safe waste treatment and immobilization specified in **TBD *[Assumed to be specified in a future ORP-controlled document to incorporate relevant requirements from contractor documents]*** for interfaces between RPP and other Hanford facilities overseen by DOE-RL (see Table C.0-4).	**ICDs (All), and [Placeholder]**		X	X	X		X	X	X	X	X
T-36	**Environmental, Safety, and Health System Requirements.** Implement system requirements applicable to safe waste retrieval and feed delivery specified in environmental, safety, and health requirements of WTP Contract Standard 7, and in accordance with the Tank Farms Authorization Envelope as necessary to ensure safe and compliant interfaces between the WTP and TFC (see Table C.0-5).	**WTP 2000, Authorization Agreement**		X	X	X		X	X	X	X	X

ORP System Requirements for Dispose (Function 5.04)			Function (WBS Element has same number)												
ID #	Requirement Key: BOLD = To Be Developed Requirement; *BOLD ITALIC = Placeholder pending formal definition*	Source		5.04.01.01	5.04.01.02	5.04.01.03		5.04.02.01	5.04.02.02	5.04.02.03	5.04.02.04		5.04.03.01	5.04.03.02	5.04.03.03
D-1	**ILAW Package Handling Requirements**. The ILAW disposal and transport system shall handle ILAW packages that meet the WTP Contract Specification 2 and shall meet the system requirements specified in ICD-15 (see Table C.0-3). The system shall also transport waste qualification samples in accordance with the requirements of **[TBD]**.	RPP MAR, Rev. 0		X	X	X									
D-2	**ILAW Disposal System Performance**. The ILAW disposal system and performance assessment shall meet the low-level waste management provisions of DOE M 435.1.	RPP MAR, Rev. 0		X	X	X									
D-3	**Initial ILAW Disposal Facility Capacity and Receipt Rate**. The initial ILAW disposal facility shall provide transportation and disposal capacity for approximately 13,500 packages received at the average rate of 5 per day and a maximum of 9 per day, as specified in ICD-15 (see Table C.0-3). Implement system requirements specified under Milestone Series Number M-20-00 and M-90-00 of the HFFACO (see Table C.0-1). Capital line item project W-520 implements the requirements to deploy ILAW disposal capacity.	RPP MAR, Rev. 0		X	X	X									
D-4	**ILAW Package Retrievability**. The disposal facilities shall be designed and operated such that the ILAW packages can be retrieved for up to 50 years after they are placed in the ILAW disposal facility.	RPP MAR, Rev. 0		X	X	X									
D-5	**Balance of Mission ILAW Disposal Facility Capacity and Receipt Rate.** Develop an additional 'Balance of Mission' disposal capacity of **TBD** ***[Assumed to be TBD total packages]*** with capability to receive/dispose of maximum daily ILAW receipt rate of **TBD**.	RPP MAR, Rev. 0		X	X	X									
D-6	**IHLW Package Handling Requirements**. IHLW storage and handling system must receive, transport, and place in storage IHLW canisters that conform to the requirements of Waste Treatment and Immobilization Plant Contract Specification 1, Immobilized High-Level Waste, and shall meet system requirements specified in ICD-14 (see Table C.0-3). The IHLW system shall also transport waste qualification samples in accordance with the requirements of **TBD.**	RPP MAR, Rev. 0						X	X	X	X				
D-7	**IHLW Initial Storage Capacity**. Provide storage capacity for 880 IHLW canisters that conform to the requirements of Waste Treatment and Immobilization Plant Contract Specification 1, Immobilized High-Level Waste in Vaults 2 and 3 of the Canister Storage Building (CSB). Implement interface system requirements for use of the CSB, including MOA 1 and MOA 2 (see Table C.0-2). Implement system requirements specified in Milestone Series Number M-20-00 and M-90-00 of the HFFACO (see Table C.0-1). Capital line item Project W-464 implements the requirements to provide IHLW storage capacity.	RPP MAR, Rev. 0						X	X	X	X				
D-8	**IHLW Additional Storage Capacity**. Plan, design and construct additional IHLW storage modules, each with a design life of 50 years and a design capacity of **TBD** ***[Assumed to be between 1,000 and 2,000 IHLW canisters for each additional IHLW storage module, with total additional storage capacity between 11,000 and 12,000 IHLW canisters, depending upon the timing and rate of shipments to geologic repository]*** .	RPP MAR, Rev. 0						X	X	X	X				
D-9	**Geologic Repository Interface Requirements**. The IHLW system shall comply with all requirements defined by the Waste Acceptance System Requirements Document (DOE 1999c) for acceptance of IHLW product in the proposed geologic repository including compliance with canister integrity and maximum centerline temperature requirements.	RPP MAR, Rev. 0 and WTP 2000						X	X	X	X				
D-10	**IHLW Storage Design Life Requirement**. IHLW storage systems shall have a design life of at least 50 years.	RPP MAR, Rev. 0						X	X	X	X				
D-11	**IHLW Shipping Requirements**. IHLW facilities, equipment, transport and storage methods and systems must transport IHLW canisters to a shipping facility, prepare them for shipment, load them into shipping casks and onto transport vehicles provided by the geologic repository program and must prepare canisters and casks for shipping in accordance with system requirements for repository acceptance specified in interface agreements, including MOA 3 (see Table C.0-2) and on the schedule and rate defined by the repository program.	RPP MAR, Rev. 0, and MOA 3						X	X	X	X				
D-12	**IHLW Canister Receipt Rate**. Design CSB storage to receive an average rate of 140 IHLW canisters per year and a maximum rate of one IHLW canister per day as specified in ICD-14 (see Table C.0-3). The IHLW system shall be designed to receive, transport and store canisters in the CSB in quantities and at rates that do not limit WTP processing.	RPP MAR, Rev. 0						X							
D-13	**ILAW Melter Disposal Facility Requirements**. Accept failed/spent ILAW melters that comply with the requirements of ICD 3 (see Table C.0-3) and the Hanford Site Solid Waste Acceptance Criteria (HSSWAC). Provide transportation and disposal system for failed/spent melters in accordance with requirements specified in **TBD** ***[Assumed to be defined in forthcoming Project W-TBD design requirements for the ILAW failed/spent melter disposal trench]*** .	TFC 2001													X

ORP System Requirements for Close (Function 5.05)			Function (WBS Element has same number)												
				5.05.01.01	5.05.01.02	5.05.01.03		5.05.02.01		5.05.03.01	5.05.03.02	5.05.03.03		5.05.04.01	5.05.04.02
ID #	**Requirement** **Key: BOLD = To Be Developed Requirement; *BOLD ITALIC = Placeholder pending formal definition***	**Source**													
C-1	**Classify Residual Tank Waste.** ***Define system requirements for designating tank waste residues and immobilized wastes as WIR in TBD [Interface Document -- Assumed to be defined in future MOA or other correspondence between DOE and NRC] (see Table C.0-2). Implement requirements as necessary to achieve and maintain WIR designation.***	**[Placeholder]**		X	X	X		X		X	X	X		X	X
C-2	**Tank Farm Contaminants And Transport.** ***Develop geologic, hydrogeologic, transport, and other data and models sufficient to describe subsurface conditions and contaminant migration near and beneath Tank Farms. Investigate the movement of contaminants to support waste retrieval and Tank Farm closure; prepare for post-closure monitoring and care, if needed; undertake near-term actions to protect the groundwater and the Columbia River; and, support NEPA analyses for RPP WTC closure.***	**[Placeholder]**		X	X	X		X		X	X	X		X	X
C-3	**NEPA Closure Analyses.** ***Prepare NEPA analyses and documentation for closure of the RPP Waste Treatment Complex (WTC) to address alternatives for closing the Tank Farms, WTP, immobilized waste, and support facilities; disposition of equipment, residual waste, and contaminated soils; compliance with WIR, delisting, and other cleanup and waste management determinations; resolution of emerging information concerning Tank Farm contaminants and transport; and, integration of RPP closure with other Hanford Site environmental restoration, stabilization, land use, and custodial activities.***	**[Placeholder]**		X	X	X		X		X	X	X		X	X
C-4	**Interim Stabilize Unused Tank Farm Facilities.** Complete the interim stabilization of 244-AR vault in accordance with Milestone Series Number M-45-00 of the HFFACO (see Table C.0-1). Complete the interim stabilization of 244-CR Vault. Perform all work defined in the acceptance criteria specified in **TBD** ***[Being developed by TFC for ORP concurrence]*** for turnover of the 242-T Evaporator for deactivation and decommissioning.	**TFC 2001, Section C.3(a)(5)(ii), TFC PI-08, and HFFACO**				X				X						
C-5	**SST Farm Closure/Post-Closure Workplan.** Develop and submit SST farm closure/post-closure workplan and updates in accordance with the requirements of DOE M435.1-1 and Milestone Series Number M-45-00 of the HFFACO (see Table C.0-1). Describe major work areas in the workplan and updates, including waste retrieval, operable units characterization, technologies development, regulatory pathway, and closure strategy.	**TFC 2001, Section C.3(a)(5)(i) and (ii), and HFFACO**		X	X	X									
C-6	**Characterize SST Farms Vadose Zone.** Perform vadose zone characterization around the SST farms in accordance with agency agreements, enforcement actions, and other regulatory requirements; integrate this work with groundwater monitoring and RCRA Facility Investigation/Corrective Measures Study activities; and, address remaining characterization, assessment, and investigative actions under Milestone Series Number M-45-00 of the HFFACO (see Table C.0-1).	**TFC 2001, Section C.2(j), and HFFACO**		X											
C-7	**SST Farm Closure Demonstration.** Conduct a closure demonstration for the first SST farm (or, alternatively, Operable Unit or Waste Management Area) in accordance with the requirements of DOE M 435.1-1 and Milestone Series Number M-45-00 of the HFFACO (see Table C.0-1). Develop a closure demonstration plan to include results of SST retrieval demonstrations; barrier design specifications developed by the Hanford Environmental Restoration Program; land uses defined in the Hanford CLUP EIS; requirements associated with other cleanup strategies; and, all other factors relevant to tank farm closure. Perform closure demonstration in accordance with the approved closure demonstration plan.	**HFFACO**		X	X										
C-8	**Tank Farm Closure Plans.** Develop closure plans to support Tank Farm closure in accordance with NEPA tank closure analyses; DOE M435.1-1; applicable regulations; and, the HFFACO (including Milestone Series Numbers M-20-00 and M-45-00) (see Table C.0-1). Closure plans shall provide closure definition, system design, authorization basis, work plans, approvals, and other information necessary for closure.	**TFC 2001, Sections C.3(a), and C.3(a)(5)(i)**		X		X		X							
C-9	**WTP, Immobilized Waste, And RPP Support Facilities Closure Plans.** Develop WTP, immobilized waste, and RPP support facilities closure and post-closure plans in accordance with the RPP WTC closure NEPA analyses; DOE M 435.1-1; applicable regulations; and, the HFFACO (including Milestone Series Number M-20-00) (see Table C.0-1). Anticipate an **IR-TBD** to define system requirements [Assumed to be future facility specifications for WTP, ILAW and IHLW facilties].	**RPP-KPA 2000, KPA Nos. 35, 36, 37, 38, 39, 40, and 45, and [Placeholders]**								X	X	X			
C-10	**Close SSTs and MUSTs.** Close all Hanford SSTs and MUSTs in accordance with approved closure plans developed in C-8. Close and stabilize facilities preparatory to transition for deactivation and decommissioning. ***Close SSTs, MUSTs, SST farms, and ancillary facilities in accordance with approved closure plans. If necessary due to waste residues remaining after closure, prepare for post-closure monitoring and care.***	**TFC 2001, Sections C. 1 and C.3(a)(5)(i), and [Placeholder]**				X				X				X	
C-11	**Close DSTs.** Close all Hanford DST Farms. Close and stabilize facilities preparatory to transition for deactivation and decommissioning. ***Close DSTs, associated DST farms, and ancillary facilities when they are no longer required to conduct the RPP mission in accordance with approved closure plans. If necessary because waste residues remain after closure, prepare for post-closure monitoring and care.***	**TFC 2001, Sections C.1 and C.3(a)(5)(i), and [Placeholder]**						X		X				X	
C-12	**Close WTP.** Safely and efficiently deactivate, decommission, and close the WTP when it is no longer needed for the RPP mission. ***Close the WTP and associated facilities in accordance with approved closure plans. If necessary because waste residues remain after closure, prepare the WTP and associated facilities for post-closure monitoring and care.***	**WTP 2000, C.7(a)(7) and (12), and [Placeholder]**										X		X	

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